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MARKED INCREASE IN SHIP BUILDING.

REPORT OF THE COMMISSIONER OF NAVIGATION FOR THE FISCAL YEAR JUST ENDED—OUTPUT EXCEEDED ONLY TWICE IN THE HISTORY OF THE COUNTRY—LAKES CONTRIBUTE FORTY VESSELS AVERAGING ABOUT 3,500 TONS EACH.

From tabulated statements prepared within the past few days by the United States commissioner of navigation it is learned that vessels built in the United States and officially numbered during the fiscal year ended June 30, 1901, numbered 1,173 of 401,285 gross tons, compared with 1,058 of 305,677 gross tons for the previous fiscal year. Unrigged barges, canal boats, etc., will add 88,331 tons to this total. Such construction the previous year aggregated 76,186 tons. The whole tonnage built has been exceeded only twice in our history, in 1854, and in 1855 when the maximum 583,450 tons was attained. Excluding unrigged barges and canal boats, three-fourths of the new tonnage is comprised in 111 vessels, each of over 1,000 gross tons. To these large vessels the great lakes, where steel ship building in the past few years has been highly developed, contributed forty steel steamers of 137,312 tons. This tonnage exceeds the steel steam product of the entire United States for any year before 1899. The industry of building on the lakes small steel steamers for the seaboard has developed considerably during the year, but as the length of the locks is only 270 ft., this construction does not materially affect salt water navigation.

The ocean steel steamers built on the seaboard were fifteen of 70,667 gross tons, to which may be added nine of 18,888 tons, all small, built on the great lakes for salt water traffic. The principal ocean steamers were three Spreckels mail steamers of 18,495 tons for the San Francisco, Honolulu, Australian mail service, three New York & Cuba Mail steamers of 15,408 tons and one Venezuelan Red D steamer of 1,713 tons, all built under the ocean mail act of 1891. The remaining ocean steel steamers are for the coasting trade, including three Hawaiian-American steamers of 16,785 tons, and four Chicago steamers of 8,628 tons temporarily in transatlantic trade. During the calendar year 1900, Great Britain launched 664 steel steamers of 1,432,600 tons, and Germany completed sixty-three of 213,984 tons, nearly all of which were for ocean trade.

Wooden schooners, the third important item, numbered twenty-two of 40,273 tons. The limit of size for these vessels appears to have been attained, and large steel schooners will be built next year. Rigged barges, some of steel and some for the Cuban trade, numbered fifteen of 24,313 tons. Nine steel ferry-boats and steam dredges of 13,907 tons were built, and six square-rigged vessels of 11,257 tons. Only four wooden steamers, aggregating 6,552 tons, exceed 1,000 tons, though 460 wooden steamers of 37,921 tons were built. Wooden sail and steam vessels number 1,052 of 141,032 tons.

The output of the different districts of the country-coasts, lakes and rivers was as follows:

Districts.	Number of vessels.	Gross tons.
Atlantic and Gulf	735	190,948
Great Lakes	105	153,138
Pacific Coast	151	46,105
Western Rivers	182	11,094
Total	1,173	401,285

The increase over last year on the great lakes is 53,362 tons and on the Atlantic coast 30,372 tons. Following are tabulated statements showing the different types of vessels built in 1900 and in 1901:

SHIP BUILDING IN THE UNITED STATES, YEAR ENDED JUNE 30, 1901.

	WOOD.				STEEL.				TOTAL.	
	SAIL.		STEAM.		SAIL.		STEAM.			
	No.	Gross tons.	No.	Gross tons	No.	Gross tons.	No.	Gross tons.	No.	Gross tons.
Atlantic and gulf	460	74,721	212	11,999	12	13,752	51	90,476	735	190,948
Pacific	55	26,961	90	11,537	.....	.....	6	7,607	151	46,105
Great lakes	8	158	46	5,124	5	11,236	46	136,620	105	153,138
Western rivers	69	1,271	112	9,261	.....	.....	1	562	182	11,094
Total	592	103,111	460	37,921	17	24,988	104	235,265	1173	401,285

SHIP BUILDING IN THE UNITED STATES, YEAR ENDED JUNE 30, 1900.

	WOOD.				STEEL.				TOTAL.	
	SAIL.		STEAM.		SAIL.		STEAM.			
	No.	Gross tons.	No.	Gross tons.	No.	Gross tons.	No.	Gross tons.	No.	Gross tons.
Atlantic and gulf	484	64,510	160	11,834	8	9,760	63	74,472	715	160,576
Pacific	52	17,756	84	12,626	....	.....	3	7,004	139	37,386
Great lakes	7	68	41	4,693	....	.....	25	95,015	73	99,776
Western rivers	24	531	105	7,337	....	.....	2	71	131	7,939
Total	567	82,865	390	36,490	8	9,760	93	176,562	1058	305,677

W. C. Richardson of Cleveland, has contracted with the American Ship Building Co. for a steel freight steamer of about 4,900 gross tons capacity, to come out next spring. This is the eleventh freight vessel under order with the American company for 1902.

A LOSS TO THE LAKE ROUTE.

INCREASE IN EXPORTS FROM SOUTHERN PORTS—QUESTION OF GREAT IMPORTANCE TO NEW YORK, BOSTON AND PHILADELPHIA.

Shipping interests of the great lakes are as much concerned as the people of New York, Boston and Philadelphia in the shrinkage of export business through those ports of late years. The reason is plain. The drift of this business to such southern ports as New Orleans, Galveston, Newport News, means so much less freight moving from the west and northwest by the lake route. Of course there is a large proportion of the business upon which the railroads leading to the south have a natural claim, but it is also true that if the people of New York state would agree upon necessary improvement of the Erie canal the result would be to the advantage of the lake route. The gains made by southern ports during the past two or three years are very marked.

Figures from the treasury bureau of statistics dealing with this subject up to the first of the present month, when the government fiscal year 1901 was at an end, are not as yet at hand, but we have the figures for nine months of the year and for the full year 1900. They show clearly the growing disposition of our exporters to distribute through the ports south of New York a part of the export trade which formerly passed through that great city. During the year ended June 30, 1900, and the nine months following (up to the first of April, 1901) New Orleans has taken second rank as an exporting port and has displaced Boston in its position as the second exporting city of the country. The very heavy exportations of cotton and the high price at which it is exported has largely increased the value of the exports through the southern ports, while it is not improbable that the Galveston disaster may have resulted in temporarily diverting to New Orleans some of the business which otherwise would have gone through Galveston. The exports from New Orleans in the fiscal year 1900 were $115,858,764, the highest figure in the history of the port, except 1892, and an increase of $28,000,000 over the fiscal year 1899. During the nine months of the fiscal year 1901 the exports from New Orleans were $122,234,669, securing for that city a clear and undisputed title to the rank of second in the list of American export cities, the figures for Boston, which formerly held second place, being for the nine months $81,173,051, or over $40,000,000 less than those of New Orleans.

A study of the percentage which each of the principal ports handled of the commerce of the country in 1900 compared with preceding years develops some interesting facts. Beginning with the port of New York it is found that it handled only 47.03 per cent. of the foreign commerce of the country, against 52.5 per cent. in 1890, 51.4 per cent. in 1896, and 48 per cent. in 1897. The loss is principally in exportations, which in 1900 were but 37.21 per cent. of the total exportations of the country, as against 41.3 per cent. in 1894; while the importations in 1900 were 63.2 per cent. of the total imports of the country, as against 63.4 per cent. in 1894.

Boston did not make a satisfactory record either in its imports or exports during the fiscal year 1900, and the nine months' figures for the fiscal year just closed show a shrinkage of nearly $5,000,000 in its commerce as compared with the preceding year. Its imports were only 8½ per cent. of the total imports of the country, as against 11.8 per cent. in 1897, 10.1 per cent. in 1896, and 8.4 per cent. in 1893. Its exports in 1900 were only 8 per cent. of the total, as against 10.8 per cent. in 1896, 10.5 per cent. in 1895, and 10.8 per cent. in 1893. Taking the total imports and exports of the country, Boston had in 1900 but 8.2 per cent. of the total, as against 10.5 per cent. in 1896, and 9.6 per cent. in 1893.

Philadelphia's percentage of the total foreign commerce of the country has remained almost stationary in the last four years, having been 5.25 per cent. in 1897, 5.31 in 1899, and 5.80 per cent. in 1900. In imports there has been a slight loss and in exports a corresponding gain. Its imports were 6.1 per cent. of the total imports into the country, while in 1897 they were 6.3 per cent. and in 1894 8.2 per cent. Its exports in 1900 formed 5.62 per cent. of the total exports of the country, as against 4.5 per cent. in 1897, and 5.6 per cent. in 1892.

Baltimore has gained both in imports and exports. Its percentage of the total imports and exports of the country was in 1900 8.28 per cent., in 1897 8.15 per cent., and in 1895 7.6 per cent. Its importations in 1900 were 2.24 per cent. of the total imports into the country, as against 1.4 per cent. in 1897 and 1.6 per cent. in 1895. Its share of the total foreign commerce of the country in 1900 was 6 per cent., as against 5.35 per cent. in 1897 and 4.8 per cent. in 1895.

Newport News shows a rapid growth in its export trade, which in 1900 represented 2.5 per cent. of the total exports of the country, as against 2.1 per cent. in 1897, and less than 1 per cent. in 1893. Its imports have also increased materially, being in 1900 more than eight times those of 1894, but forming, however, less than 1 per cent. of the total imports into the country.

The gulf ports increased their exportations materially, especially in cotton, wheat and flour. Galveston increased her exports over those of last year about $7,000,000, and New Orleans increased hers about $28,000,000. New Orleans also materially increased her imports, which in 1900 were $5,500,000 greater than in 1899.

It is announced that the Dominion Iron & Steel Co., Sydney, N. S., has offered to give an order for four freight steamers to any concern that will locate a ship building yard there. A company is now considering the advisability of locating there. Those interested in the site are B. F. Pearson and H. Crowe of Halifax, J. H. Thompson, B. Harding and G. McAvity of St. John, N. B. Should a ship building plant be established a bonus from the Dominion government will be asked.

INDEPENDENCE'S REMARKABLE RUN.

More or less disappointment is expressed throughout the country that the Boston boat Independence is not to have a go for the America's cup. Her remarkable performance in sailing Sunday of this week from Vineyard Haven to New London in eight hours, with the wind almost head on, will add somewhat to the disappointment. The distance is eighty miles, as the crow flies, the yacht averaging ten knots an hour, but making at times on several stretches much better speed. For more than one-half of the stretch the water was suited perfectly to the flat-floored yacht and she went along under working topsails and three lower sails at a great pace. From Gayhead to a point a few miles beyond Point Judith the Independence had to contend with a long southwest swell, the result of a previous blow, and she bumped into it with considerable commotion, her speed being materially lessened during this time.

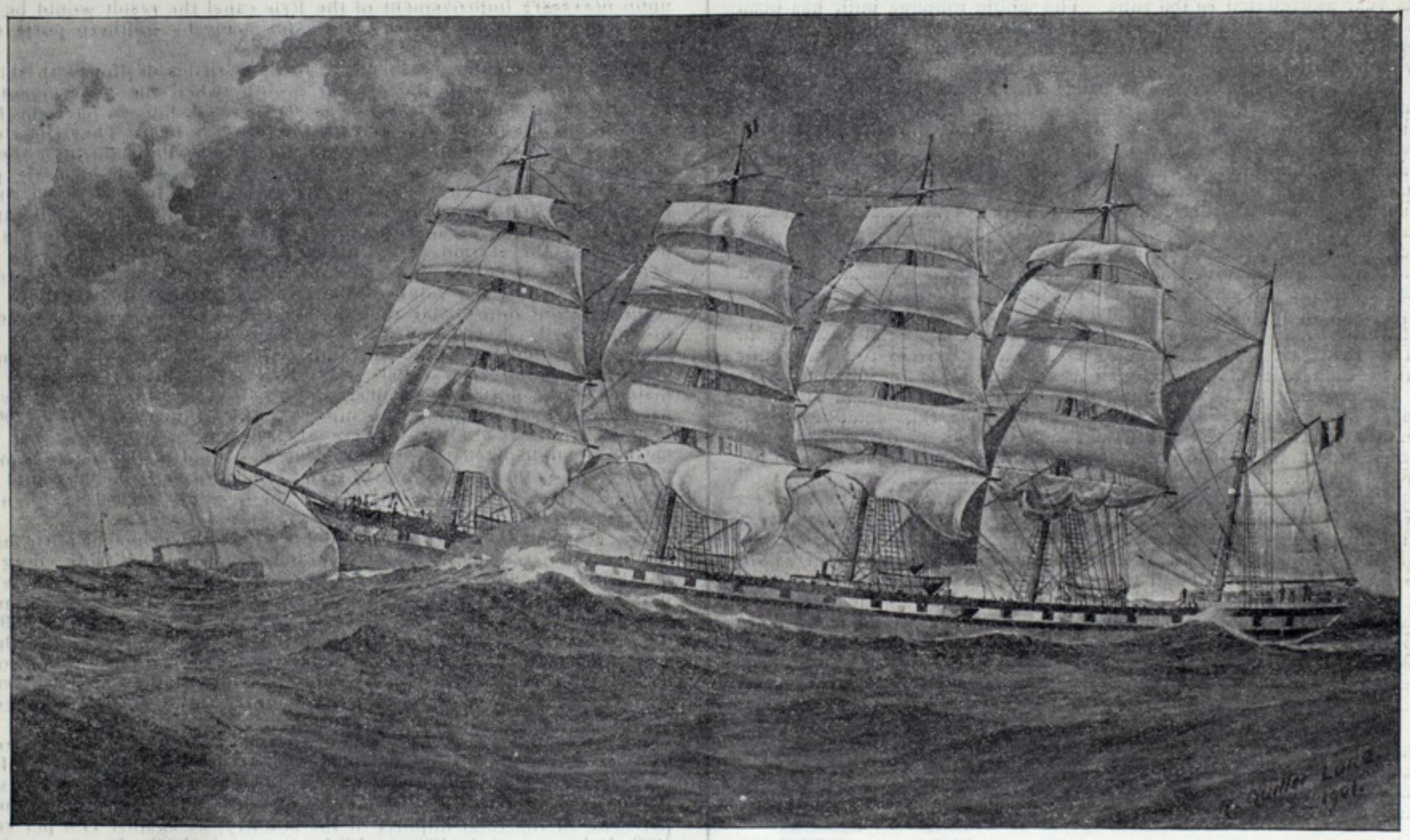
The best work of the yacht was from half-way between Judith and Black island to Watch Hill, a distance of 17½ miles, when she traveled at better than a 12-knot clip. One-half of this stretch was made under three lower sails only, the wind having freshened when off Queen Hill, and the triangular piece of cloth aloft was ordered down. The entire distance from when Charles Foster tacked ship between Point Judith and Block island to New London light was made in one long board with boom to starboard. Another long stretch of easy sailing was from off Gay Head, where she tacked to port at 12.35 and headed straight for the westward. She was held on this tack for 26½ miles, the crew taking matters easy while Designer Crowinshield and Mr. Foster stood tricks at the wheel to relieve Capt. Haff. This long distance was sailed over in 2 hours and 43 minutes, showing that her average speed was about 10 miles an hour for the greater part of the course.

The Chesterton took the Independence in tow at Vineyard Haven at 10.30 o'clock and went slowly out to East Chop, where the yacht was swung into the wind and her mainsail hoisted. It was swayed into place at 10.40 and five minutes later the jib was broken out and the forestays all hoisted. The yacht went out past West Chop buoy on the port tack, her sails drawing finely and giving her a gentle heel. The wind was then blowing about 10 knots an hour, but as she opened out across the sound toward Tarpaulin Cove, 6 miles away, it dropped slightly. Just under Tarpaulin Cove light the sloop yacht Hypatia, with Commodore Codman of the Dorchester yacht club and a party of friends on board, was passed and the Independence received a hearty greeting. Haff tacked to starboard at 11.30 and stood across the Vineyard, coming about again fifteen minutes later to clear a tug and her barges. Under the Naushon shore Haff swung her to starboard at 11.50 and a couple of men were sent aloft to lace the gaff topsail to the topmast as it went up. The sail was sheeted home exactly at noon as the Independence tacked to port and headed for Pasque Isle. The increase of canvas made itself felt immediately and gathering away rapidly, the yacht raced along in fine style. Going down the sound the Boston sloop met the long swell from the southwest and although at times she pitched right into it, the waves did not knock her off any. At 12.30 Haff swung her about again and stood out past Gay Head fifteen minutes later. With Gay Head light bearing southeast about two miles, the yacht went off on the long board to port which she was held on for nearly three hours.

No attempt was made to get the best speed possible out of the yacht, the crew lolling about in comfortable positions along the weather rail. Getting farther up the coast the breakers came in sight and the Independence was under the Narragansett shore very quickly after that. At 3.17 when two miles south of the pier, Crowinshield tacked ship and stood out toward Block island for about seven miles. Off Point Judith, the usual heavy swell was met, but the yacht plunged along with scarcely diminished speed. The crew manned the pump and worked for a few minutes to get the water which had come through the several imperfectly caulked seams out of the fin. It was just 4 o'clock when Mr. Foster swung her to starboard on what proved to be the last hitch of the day. The wind was increasing steadily, and several times the yacht's lee rail was awash. Her speed was then at its best and the storm king could not hold the sloop. Further along the shore, when off Queen Hill, the breeze was still increasing, and at 4.43 the topsail was lowered. Even under this diminished canvas the yacht traveled along at a great pace and left the tug Wrestler steadily. Watch Hill was passed at 5.30 and Race Rock forty-eight minutes later. Sheets were eased at 6.45 around New London light for the run up the mouth of the Thames, and anchor was cast off the Pequot at 7.15.

A GREAT CLIPPER SHIP.

On this page will be found a drawing of the clipper ship France, reported as lost in the south Atlantic. With the single exception of the Petosi, she is the largest sailing ship ever built. She was built in 1890 by Henderson & Co., Partick, Scotland, for Messrs. Bord of Bordeaux and sailed under the tri-color. Her length is 360 ft. between perpendiculars, with a beam of 50 ft., and her registered tonnage of 3,750 tons, with a carrying capacity of 6,150 tons. She was built with a double bottom and could carry 2,200 tons of water ballast. Her sail area is enormous. She was designed as a four-master, but to balance her enormous spread of canvas an extra mast was stepped. The France was a beautiful thing to look at.



SAILING SHIP FRANCE, LONG OVER DUE AND PROBABLY LOST.

JAPAN'S ADVANCE IN SHIP BUILDING.

The determination of Japan to become in every sense a modern nation is amply illustrated in its advance in ship building. The ship yard in Tokio, which covers sixty acres, is reported as employing 3,000 men and to be equipped with the latest machinery, including pneumatic riveters, and several steamers aggregating 180,000 tons are on the stocks, two of them for the Nippon Yusen Kaisha. The yard is also equipped with electricity. The ship building yard at Nagasaki is also progressing, but special interest attaches to the government yard. The government works are on the eastern shore of Kiushiu, the most southern of the large islands forming the empire, and are therefore contiguous to China. The establishment, which covers over 230 acres, is close by the coal fields connected with the railways. In addition to the blast furnaces there are coke ovens, and in the steel department open-hearth Bessemer furnaces with a full set of rolling mills for roughing, three-bar mills, as well as rail, sheet and plate rolls.

A very attractive engraving, intended to represent the finish of the City of Erie-Tashmoo race, is a feature of a special time card for July and August service, in connection with the Pan-American exposition, just issued by Passenger Agent Herman of the Cleveland & Buffalo line. During these two months a steamer will leave Cleveland at 8 a. m. daily excepting Sunday, arriving in Buffalo at 6 p. m.; another steamer will leave daily (Sunday included in this service), at 8 p. m., arriving in Buffalo at 6 a. m.; on Tuesdays, Thursdays and Saturdays an extra steamer will leave at 5 p. m., arriving in Buffalo at 5.30. The service from Buffalo to Cleveland will be a duplication of that just noted. Fare on the day boats will be $1.50 and on the night boats $2.50.

OIL-BURNING APPARATUS IN TORPEDO BOAT.

Messrs. Yarrow & Co., of Poplar, England, have just built to the order of the Dutch government the torpedo boat Pangrang. Two others, Ophir and Rindjani, duplicates, are building. The vessels themselves, says Engineering of London, are of the ordinary modern type, having triple expansion engines and two Yarrow tube boilers. The notable feature about them is that the boilers are fitted with a supplementary oil-burning apparatus. The idea of the Dutch authorities is that the oil-burning should be looked on as a reserve to be used in case of need when an extra effort is required for a short period. Under ordinary circumstances coal alone is burnt in the usual way. There are, however, three of Holden's liquid-fuel injectors fitted to each boiler, and those are brought into operation when an extra spurt is required. The oil is supplied from a tank on deck. It is sprayed by means of steam, thus doing away with the additional machinery and consequent added complexity of an air-compressing plant; no small advantage on vessels where space is so confined as in a torpedo boat. Naturally the use of steam necessitates the loss of a certain amount of fresh water. This would be inadmissible were oil the only fuel used, or even if it were constantly used; but for short runs, at high speed, such as would be actually demanded, the comparatively small quantity of steam needed would entail the use of an unimportant quantity of water.

On a trial made with this boat, coal only was burnt on one run. The air pressure for draft in the furnace was 1 in. on the water gauge; the engine stop-valve was kept full open. The following were the observed results: The boiler pressure was 150 lbs. to the square inch; the pressure in the first receiver was 54 lbs., and in the second receiver 5.5 lbs.; the vacuum was 23½ in.; and the revolutions 340 per minute. The speed was 24½ knots. The oil fuel was then started, and as much oil was burnt as was possible without making smoke. The coal burnt was at the same rate as before. The results were then as follows: Boiler pressure, 180 lbs. per square inch; first receiver pressure 64 lbs., and second receiver pressure 9 lbs. The vacuum was 23¼ in.; and the revolutions 365 per minute. The resultant speed was 26½ knots.

From this it will be seen that by turning on the oil feed the speed was increased by just 2 knots. Moreover, this increase was obtained almost instantaneously, or, at any rate, within a few seconds of the oil being turned on. Borneo oil was used and the supply for the two boilers was at the rate of 700 lbs. per hour. The coal burnt per hour was at the rate of 2800 lbs., both when coal alone was used and when it was burnt in combination with oil. The oil tank, fitted, holds a supply sufficient for a run of an hour and a half under the above conditions of working. It is placed on deck, so that if it should be pierced by shot and the oil should escape, it would simply run into the sea.

A feature that would prove of considerable importance in actual warfare would be the fact that the boilers could be worked at very high rates of evaporation although the fires were in a dirty condition. A torpedo vessel would probably often have to operate at some little distance from its base, thus necessitating a comparatively long run made at moderately high speed before the final spurt, preceding the discharge of a torpedo, were made. The result would be that grates would be clogged, and it might even be advisable to lay off and clean fires before proceeding to action. Such an operation, with the letting down of steam and the creation of smoke, would do very much to endanger the success of the attack; and yet high speed is one of the first essentials to surprise, which in turn is a necessary element of approved torpedo boat practice. With the oil fuel, high speed can be maintained with dirty fires, and also with inferior coal. What is true of torpedo craft is also true of larger vessels under the conditions of service common to them.

It may be pointed out, in connection with this matter, that the jets for spraying oil into the firebox are placed at a considerably higher level, and consequently there exists, as it were, two layers of fire. The result is the same as if the fire grate area were largely extended.

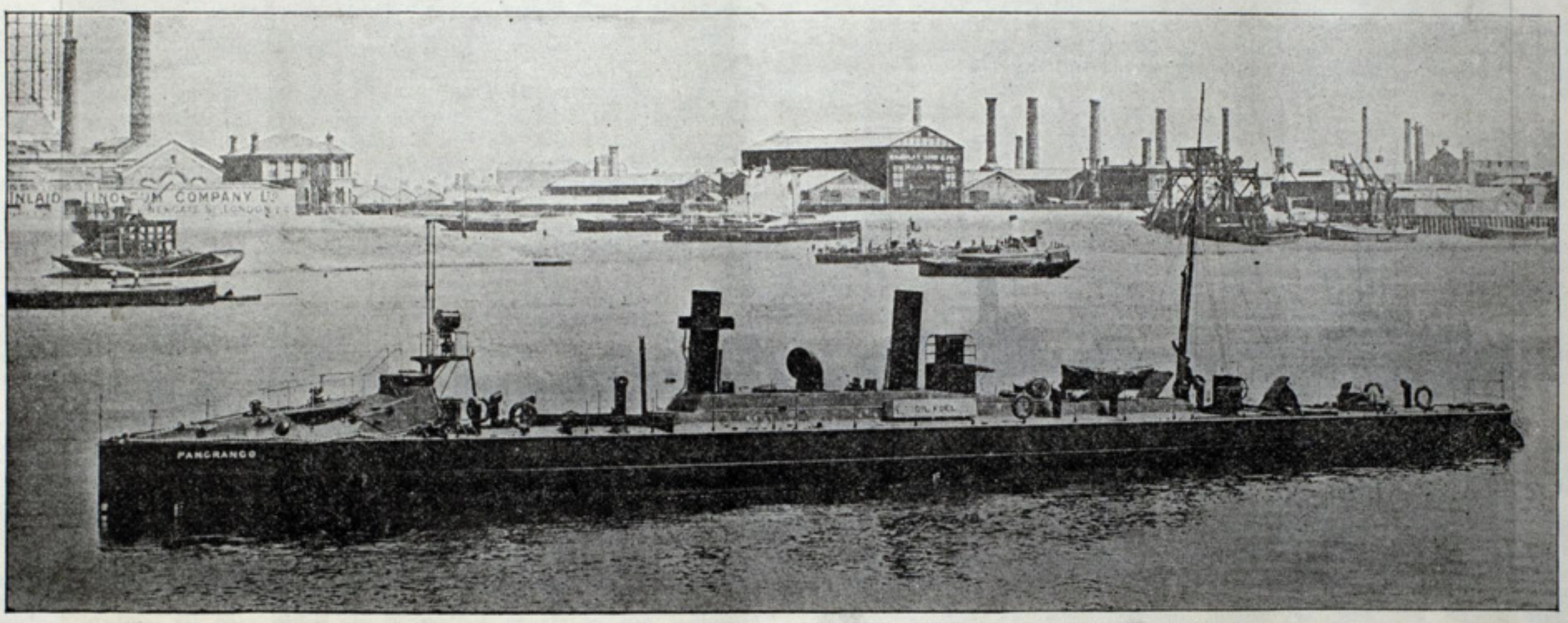
On the trials no difficulty was found in avoiding smoke, this being simply a matter of adjustment between the air supply and the amount of oil burnt. In a forced draft stokehold this is easily accomplished so long as the stokers can see the tops of the funnels. It would also appear from observation that the rush of steam and oil vapor into the firebox has the effect of mixing up the gases in the furnace more effectually, and this in itself leads to prevention of smoke and adds to evaporative efficiency.

The trials with this system have been looked forward to with considerable interest, and doubtless their successful issue will lead to an extensive adoption of supplementary oil-burning by the naval authorities of various governments. The power of instantly increasing speed so greatly on emergency is an immense tactical advantage and might easily decide the fate of an encounter. Hitherto, harder blowing has been depended upon as a means to this end, but those who have had experience of excessive force draft know the dangers it entails. With dirty grates it is especially difficult to use, and often results in simply blowing holes in the fire for the admission of cold air and driving cinders up the funnel.

DESTRUCTION TO SUBMARINE BOATS.

Cable dispatches announce that the British torpedo boat destroyer Vernon has been experimenting for a few days at Portsmouth with secret admiralty devices for destroying submarine boats. The submarine boats, under present conditions, before attacking a ship must come to the surface and take bearings or else betray their presence with an optic tube or a periscope.

"With the new invention," says the English report, "the sighting of a submarine boat entails on her almost certain destruction. The sighting is now practically certain. It is not to the public benefit, however, that the means employed should be stated, for the principle has other and varied uses. But in general terms it may be stated, that it is proposed that each destroyer shall be fitted with a crutch upon which a boom 42 ft. long works. This boom normally stows inboard and forward. At the far end a charge of explosives is carried which can be set off like all spar torpedoes. On going into action the boom is slung out well forward and immersed at the proper moment. The immersion carries the boom end downward and aft and it is exploded directly the submarine boat is passed. The speed of the destroyer carries her past the center of explosion before its full effects reach her, though in any case the destroyers are too light to be seriously affected. With the submarine boat it is different, as it experiences the full force of the concussion. Within 60 or 100 ft. or more of the center of the explosion, according to the charge employed, the sides of the submarine boat should be compressed sufficiently to cause fatal leaks, while even at a greater distance stability should be destroyed. The experiments at Portsmouth were not enough to indicate exactly the best position for the boom, and the first boats fitted out with the new device will probably vary somewhat between having it on the quarter or right aft. The additional weight of the boom will be slight, and in the case of the destroyer which has been experimentally fitted the weight has been more than compensated by fitting her with aluminum instead of the usual torpedo tubes. This particular device is merely one of several equally simple guards against submarine torpedo boats."



TORPEDO BOAT PANGRANG, FITTED WITH SUPPLEMENTARY OIL BURNING APPARATUS.

MICHIPICOTEN HARBOR.

W. B. Rosevear, general traffic manager of the Algoma Central Railway Co., furnishes the following information relative to Michipicoten harbor:

"Four steamers, each drawing 17 ft. 6 in. of water, moved thirty cargoes of ore from the dock last season without any difficulty. With the exception of the rock near the pier head, the harbor space has been dredged to 20 ft. It is expected that the rock will be entirely removed about the first of July. The Canadian government has arranged to build a light-house this year on Gros Cap point. A small light will be maintained on Gros Cap point from the opening of navigation until the light-house is erected. The railway company will maintain, also, a floating light to mark a shoal on the western side of the harbor entrance. According to a chart already issued by the United States hydrographic office, a light is now shown on the western end of the two islands at the eastern side of entrance to the harbor. A light is also shown at the southern corner of the freight shed on the outer end of the commercial pier. Throughout the present season of navigation the Algoma Central Railway Co. will exhibit a fixed white light on Mamainse point, in Rousseau's house or on one of his buildings. This point is called Coppermine point, the name Mamainse being given to the point to the northward, thus reversing the positions of the two points as named by the Canadian authorities."

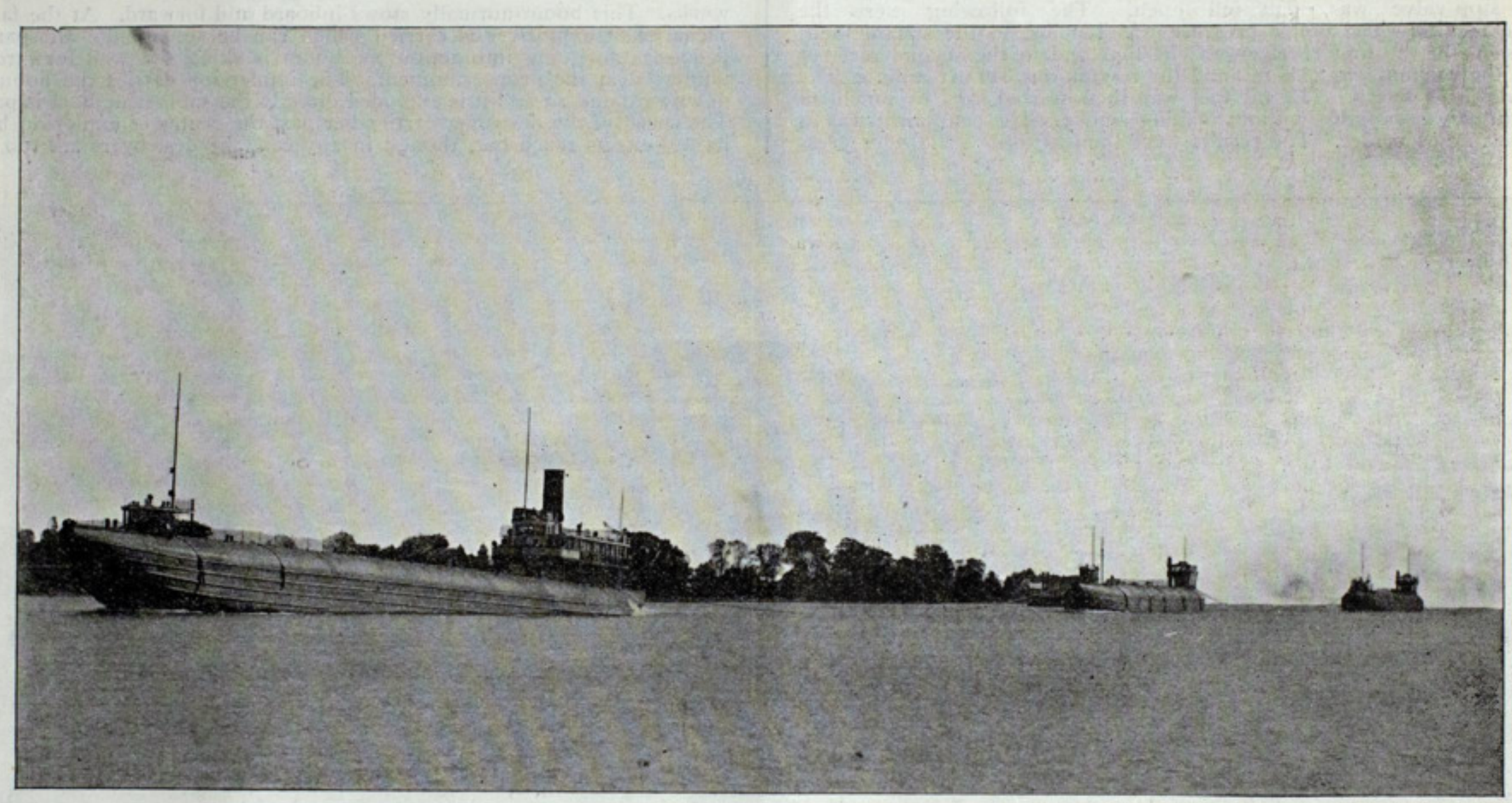
BUSINESS OF MARINE SURVEYING.

Rear Admiral Sir Wm. J. L. Wharton, hydrographer to the British admiralty, has remarked that there is nothing mysteriously difficult in the art of hydrographical or marine surveying. He claims for it that it is an eminently practical branch of the naval profession. This it may be, but if the results obtained are to be reliable the surveyor must have special knowledge, in addition to common sense and the faculty for taking pains. Considering the subject as a phase of naval work, there is hardly any other which is more useful or interesting, as it is quite as necessary to protect the costly merchantman from hidden shoals and sunken dangers as it is to guarantee immunity from the attack of a visible enemy in the shape of an hostile warship. It might be thought, from the vigilance with which the bed of the ocean has been explored, that in these days there was very little work for survey vessels, but the duties of this kind resemble those of the proverbial housewife—they are never done. The configuration of the sea bed, especially within the 100 fathoms mark, is undergoing repeated change, and unless these alterations are known and notified to mariners much mischief may be done. Often, too, the government officials are advised that such and such a vessel has discovered a new shoal or other uncharted danger. Very frequently, however, these "Vigias," as they are styled, are mere will-o'-the-wisps, which completely elude the search of the survey vessels. At the same time, the fact that they cannot be located does not prove their non-existence. Rear Admiral Wharton states that experience shows that 90 per cent. of these "bugbears and blots" on the oceanic charts have been mistakenly placed there. Dead whales, schools of fish, wreckage, floating debris, may all and each give rise to the suggestion of a shoal or rock. Still it is unsafe to altogether discount the report of the merchant ship master. Coral reefs grow rapidly and rise from very deep water, and hence the reported danger may be really existent. The difficulty of search is generally increased by the reporting ship being out in her longitude. This the hydrographer recognizes, and he points out that within 1½ miles of many coral banks it is possible to get soundings of 2,000 fathoms, so that the search for these isolated and sunken dangers is akin to looking for the needle in the haystack. When groping for "Vigias," fish by night or birds by day may indicate the presence of the sought for reef, but, all the same, it is unpleasant work drifting about at night in the vicinity of even an alleged reef. The head of the British survey department suggests, therefore, that under such circumstances it is advisable to ease a kedge anchor down to a depth of about 100 fathoms, which will indicate that bottom is reached before the ship strikes on the reef. The submarine sentry, too, should be constantly towing, set to about 30 fathoms.

Searching for pinnacle rocks is another protracted and oftentimes unsatisfactory labor. There is no royal road to discover these menaces to the navigator. Their alleged position is usually erroneous, and from their limited size, a line, or in fact, lines of soundings might fail to locate them. The plan usually followed, therefore, is to connect weights sunk from the sterns of two or more boats by a line, and then the boats steam, or are pulled slowly along parallel lines. This method of examining the sea bed is a very tedious operation, and even men as well as officers have quite an understandable aversion to "sweeping."

The easiest, but perhaps the least valuable, phase of ocean survey work is deep sea sounding. For this interesting operation wire has altogether superseded hemp. Formerly, it was found that where a sounding was taken through a surface current, the hempen line was deflected from its downward path, and consequently, when the weight reached the bottom of the sea, the amount of line out was no true index of the vertical line from the sea surface to sea bed. With the fine wire now used this disability is removed. It is usually galvanized steel wire of 20 gauge, supplied on drums in 5,000 fathoms length, which are sometimes in one piece, but sometimes have an undesirable splice. The breaking strain of the wire is 240 lbs. and the greatest care is taken to keep the wire in good condition. For this purpose the drums are hermetically sealed and the wire most carefully transferred to the reel, and is well greased in the process. If the depth is not more than 1,000 fathoms or a little over a mile, the weight can be recovered, for 40 or 50 lbs. is quite sufficient. For greater depths the sounding rod is used, and cylindrical iron weights of 20 or 25 lbs. with cylindrical holes cast in them through which the rod is passed. When the sea bed is reached the rod is forced into the bottom, and being hollow brings up a sample of the deposit on the ocean floor, while a slipping arrangement releases the weights which slide off the rod. A necessary part of the apparatus is 10 fathoms of hempen line between the wire and the rod, to act as a sort of buffer and prevent the kinking or looping of the wire. The sounding line must stop paying out as soon as the weights reach the bottom, if not, the wire kinks and breakage follows.

Very important, too, is the handling of the ship while soundings are taken. She must be kept head to current and if by any chance she is allowed to change her position and get broad-side-on, fouling and consequent breakage are almost certain. A 500 fathom length of the wire weighs 7½ lbs., so that 5,000 fathoms or about 5½ miles, will weigh 75 lbs. The wire pays out at the rate of 100 fathoms per minute. Thus, to take a sounding of 2,000 or 3,000 fathoms is a very expeditious matter compared with what it was in the "hempen" days. But besides ascertaining depths, deep sea sounding also reveals the temperature and the nature of the deposits on the ocean floor. Surveys have demonstrated that there is a slow creep of cold water, almost icy cold in fact, along the sea bed from the poles towards the equator, where it is warmed; rises to the surface; is super-heated; and flows off as surface currents, of which the gulf stream is the most marked specimen, towards the poles. With regard to the deposits on the sea bed, these vary in proportion to distance from the shore. Fine particles of earthy matter are carried seawards by each river, and the less weighty portions of this land waste may be carried hundreds of miles before coming to rest on the sea bed. But before this land silt ceases, it is found mixed with the various organic oozes, the minute skeletons of the microscopic organisms which inhabit the surface waters of the ocean, and whose remains form not the least appreciable portion of the deposits on the floor of the deep sea. In the most depressed parts of the sea bed, however, these organic remains are missing, the probability being that their descent from the surface waters, in which the live organisms make their habitat, is so slow and protracted that the limy or flinty skeletons are dissolved before the bottom is reached. These remotest recesses of old ocean show a floor covering constituted for the main part of minute mineral particles—occurring as mud—which are undoubtedly of volcanic origin.—Syren & Shipping, London.



A TOW OF WHALEBACK VESSELS ON THE GREAT LAKES—STEAMER BARTLETT AND CONSORTS.

While the new electric development works of the St. Lawrence Power Co. at Sheik's island, Ont., were primarily intended for the sole purpose of lighting the Cornwall canal the company will probably transmit power also to Montreal. Power for working the plant will be supplied by water from the Cornwall canal through a very short head race and will discharge directly into an old channel of the river St. Lawrence. The locks are provided with from six to thirteen lights and motors are provided for handling the sluice gate and for opening and closing the lock gates. The entire electrical equipment is furnished by the Bullock Electric Mnfg. Co. of Cincinnati.

Another steel company will soon be in position to seek a share of the business of making shapes for the construction of ships. The Diamond State Steel Co. of Wilmington, Del., is not now engaged in rolling a full line of shapes but they are working on a mill which will enable them to roll all the rounds, squares and flats (other than plates), together with the angles, tees, channels and beams used in vessel construction, and hope to have the same ready for business within about six months. All the shapes will be rolled of open hearth steel, both acid and basic.

LAKE SHIP YARDS FILLING UP FOR ANOTHER YEAR.

It is now more than probable that before the close of navigation the ship yards of the great lakes will all have secured orders enough to keep them fully employed throughout next winter. It is even expected that the close of the present month will find all berths engaged in the several works of the American Ship Building Co. Options have been taken on some berths for which contracts will be announced shortly. Negotiations for new vessels are under way with about a dozen owners. It is all due to a more prosperous season of navigation than was looked for last spring and to the general belief that numerous new enterprises all over the country, some of them involving two or three years in their completion, will be carried out, and that in iron and steel lines especially the future is very promising as regards foreign business. With an order for five steel freight steamers, placed a few days ago by J. C. Gilchrist of Cleveland, the American Ship Building Co. already has under contract ten large freighters for next year, in addition to three very large side-wheel passenger steamers that are to be built at the Detroit works. The Gilchrist order alone involves about $1,250,000 worth of work. Within less than a year Mr. Gilchrist has ordered thirteen steel freight steamers from the American company. Including the five steamers just ordered the Gilchrist fleet numbers sixty-four vessels, and may, of course, be largely increased before another season comes around, as it is being added to by purchase right along. The new steamers are to be considerably larger than any now in the fleet. They will be duplicates and of about 5,600 gross tons capacity. Dimensions are: Length over all, 400 ft.; length of keel, 380 ft.; beam, 50 ft.; depth, 28 ft. Engines will be of triple expansion type with cylinders of 22, 35 and 58 in. diameter and 42 in. stroke. Two Scotch boilers in each vessel of 13 ft. diameter and 12 ft. length will be fitted with the Howden system of hot draft.

At the works of the Craig Ship Building Co., Toledo, the passenger steamer Iroquois, which is being built for the Arnold Transportation Co. of Mackinaw Island, Mich., and a smaller passenger vessel, the Lake Side, for the Sandusky & Island Transportation Co. of Sandusky, are so near completion that they will be delivered to their owners shortly. The Iroquois is expected to be even faster than the Chippewa, built some time ago for the Arnold company, and which is in service between Mackinaw and Sault Ste. Marie. On a recent trip from Mackinaw to the Sault, the Chippewa made the run from Mackinaw to Detour, 38½ miles, in 1 hour and 40 minutes. The Chippewa and Iroquois, as well as the Lake Side, and another fast passenger vessel, the Puritan, now operated on Lake Michigan by the Graham & Morton Transportation Co., are fitted with Roberts water tube boilers. Two steamers of Canadian canal dimensions, building at the Craig yard for the United Fruit Co. of New York, and which are to engage in salt water trade, will keep the Toledo works employed for some time yet, but negotiations for new work for next year are, of course, under way. Mr. John Craig says that his plans for more work are along the lines on which the company has been engaged for some time past and are such that it will probably not be necessary to seek orders for the kind of freighters that furnish most work to the consolidated lake yards.

The Williams Transportation Co. of Chicago, operating passenger and freight vessels on Lake Michigan, is negotiating for the construction of a large side-wheel steel passenger steamer—excursion type—for Chicago-South Haven service. The plans contemplate a vessel of about 325 ft. length, 20 miles speed and to cost in the neighborhood of $300,000. Such a vessel would make two trips a day between Chicago and South Haven.

It was expected that both of the steamers of 700 ft. length building at the Globe works of the American Ship Building Co. in Cleveland for transatlantic service (to be taken to the coast in two parts) would be finished in time to pass down the Canadian canals to the seaboard before the close of navigation, but work on the ships has been so delayed that probably only one of them will go down this fall.

H. J. Pauly and others of Milwaukee are among lake owners who are figuring on new ships. If price and delivery are made satisfactory they will build two freight steamers of about 350 ft. length each, to engage in grain and coal trades.

LIGHT-SHIP ON SOUTHEAST SHOAL, LAKE ERIE.

Capt. George P. McKay, chairman of the committee on aids to navigation of the Lake Carriers' Association, placed a light-ship on the southeast shoal of the Point au Pelee passage, Lake Erie, Sunday. The vessel selected for this purpose is the old schooner Smith & Post, which has been refitted with a small boiler for signaling and also with the necessary lamps. The vessel is painted the familiar red of the government light-ships, and in the day time, at least, is a decidedly conspicuous object. The vessel will carry lights upon each mast—red above white and 10 ft. apart. The lights were displayed for the first time on Sunday night. Vessels which have passed since then report that the lights are dim and cannot be distinguished at a greater distance than about two miles. This is probably due to some fault inherent in the lamp, and Capt. McKay will appreciate it as a favor if passing vessels will report to him their opinion of the light. If the present lamps are inadequate new ones will be substituted. The vessel is equipped with two 8-in. whistles for signaling during foggy weather. New drums are being placed upon the boiler in order to furnish sufficient steam to give a blast of twenty seconds duration every two minutes during foggy weather. For the present the blast is of briefer duration.

Capt. McKay has written to Chief Engineer W. P. Anderson of the department of marine and fisheries, Ottawa, requesting the transfer of the gas buoy at present on the middle ground to Grubb's reef and the transfer of the gas buoy now on the southeast shoal to the middle ground, until such time as the crib at the latter point is completed. It is proposed when the crib on the middle ground is completed to place the gas buoy on Little's point.

One fare for the round trip to the Pan-American exposition at Buffalo via the Nickel Plate road beginning June 1 and continuing the entire summer; good returning within ten days from date of sale. Write, wire, 'phone or call on nearest agent, or E. A. Akers, C. P. & T. A., Cleveland, Ohio. 84, Aug. 1.

AROUND THE GREAT LAKES.

A cargo of copper ore and manufactured copper, valued at about $1,200,000, was delivered in Buffalo a few days ago from the Lake Superior copper region by the steamer Geo. A. Flagg, owned by D. R. Hanna and others of Cleveland.

It is reported from Chicago that Barry Bros. of that place who contemplated purchasing from M. A. Bradley and others of Cleveland the wooden freight and passenger steamers Empire State and Badger State for service on Lake Michigan in connection with other Barry vessels, have given up the scheme.

It is estimated that hard coal shipments from Buffalo and Erie by lake to July 1 are about 200,000 tons short of what they were on July 1 a year ago. The movement during June from Buffalo aggregated only 212,518 tons, against 261,313 tons in June last year. In May last year 288,233 tons of hard coal were shipped from Buffalo; this year May shipments were very light on account of the late opening of navigation.

Following are names, valuations and tonnage of new vessels appearing in the July 1 supplement of the Inland Lloyds Register: Gilchrist, $210,000, 3,871 gross tons, owned by J. C. Gilchrist and others, Cleveland; Lake Shore, $210,000, 3,871 tons, owned by J. C. Gilchrist and others, Cleveland; Charles S. Neff, $90,000, 1,008 tons, owned by Samuel Neff & Sons, Milwaukee; Frank H. Peavey, $275,000, 5,002 tons, owned by Peavey Steamship Co., Duluth; Geo. W. Peavey, $275,000, 5,002 tons, owned by Peavy Steamship Co., Duluth. Two barges for pulp wood trade, built by James Davidson of West Bay City and owned by Frank Perry of Sault Ste. Marie, are rated B 1.

Major Dan C. Kingman of the United States engineer corps, in charge of Toledo harbor improvements, has issued the following notice: "A row of stakes or other marks has been, or will be, placed near each side of the straight channel, Toledo harbor, and will be maintained during the periods required for dredging. Interference with such marks is prohibited by law. Special attention is invited to the outer stakes, beyond the can buoys, where the natural depths are from 12 to 21 ft. A light will be shown on the outer stake of each line (or row) from sunset to sunrise. Masters and pilots are requested to avoid the risk of injuring or displacing the marks by keeping in the straight channel throughout its entire length. A penalty for interfering with these stakes is provided by law, and will be enforced, if necessary to protect them."

One of the two 5,000-ton ore steamers building at the works of the Detroit Ship Building Co. in the name of Frank E. Kirby, will be ready for service about Sept. 1. The company owning this vessel will be known as the Yosemite Steamship Co. Officers are: Truman H. Newberry, president; Cyrus Lothrop, vice-president; Henry P. Joy, treasurer; Philip H. McMillan, secretary, and M. E. Farr, manager. The steamer Hugamo, being built at Detroit for the Hugamo Steamship Co., for coastwise ocean service, will be launched in about six weeks. The owners of the Hugamo are H. F. Morley and others. As soon as the Hugamo is off the stocks the Detroit Ship Building Co. will lay the keels for the three new side-wheelers, one for the White Star line and two for the Detroit & Buffalo Transit Co. The three new passenger steamers will be ready for service about the opening of navigation next year.

Reports from ore shipping ports are not all at hand, so that a full statement of the shipments during June can not be made, but it is more than probable that the estimate of 4,000,000 tons moved in June is very wide of the mark. Ports at the head of Lake Superior have not in fact shipped as much ore as they did in June, 1900. This information, of course, tends to strength in the lake freight market from the vessel owners' standpoint. From Duluth the following report is made for the month just passed: Duluth & Iron Range Railroad, 870,000 tons; Duluth, Mesabi & Northern, 629,579 tons; Eastern Minnesota, 339,083 tons; total, 1,839,362. For the corresponding month last year the record was as follows: Duluth & Iron Range, 624,000 tons; Duluth, Mesabi & Northern, 709,073 tons; Eastern Minnesota, 282,946 tons; total, 1,916,019 tons. For the corresponding month in 1899 the shipments were as follows: Duluth & Iron Range, 600,000 tons; Duluth, Mesabi & Northern, 428,563 tons; Eastern Minnesota, 112,396 tons; total, 1,040,959 tons.

STEEL SHIP BUILDING IN CANADA.

The question of steel ship building in Canada has been brought before the dominion in various ways during the last few months and is being made an issue in the proposition to vote a subsidy to a fast line to Great Britain. A statement on the subject made by the minister of finance in the house of commons recently, is of considerable importance. He said:

"While no formal negotiations have taken place, which can be submitted to parliament, I have taken pains to see that great ship building companies in the old country have been communicated with on the subject. Intimation has been given them that if any one of them would approach this government with a proposal they would find the government ready to give every possible consideration to it. I have had some conversations with gentlemen connected with very great enterprises of the kind in the old country, and, while willing to consider the idea, they rather estimate difficulty in the way more serious than my friends at home will admit. People speak of the building of a steel steamer as if the great consideration was the making of the steel plates, whereas the steel plates are only a very moderate proportion of the total cost. The real difficulty is in the assembling of the material, construction, the machinery and also in the importation of skilled labor. The difficulties of that character are much greater than those connected with the production of steel plates. The latter we will overcome in a very short time. I am only too pleased to find some of the honorable members taking the view they do of this matter. If we are to give this contract to any company and that company is disposed at a small advance to undertake to build the (fast Atlantic) ships in Canada, we would be disposed to give such a proposition every consideration. And I may repeat that while we have had no formal negotiations, the matter has not been overlooked and a proposition of some kind may yet be submitted."

A new chart, in colors, of Erie harbor and Presque Isle, has just been issued and may be had from the Marine Review. A new chart of Buffalo harbor and Niagara river to the falls is also in print.

PAN-AMERICAN EXPOSITION.

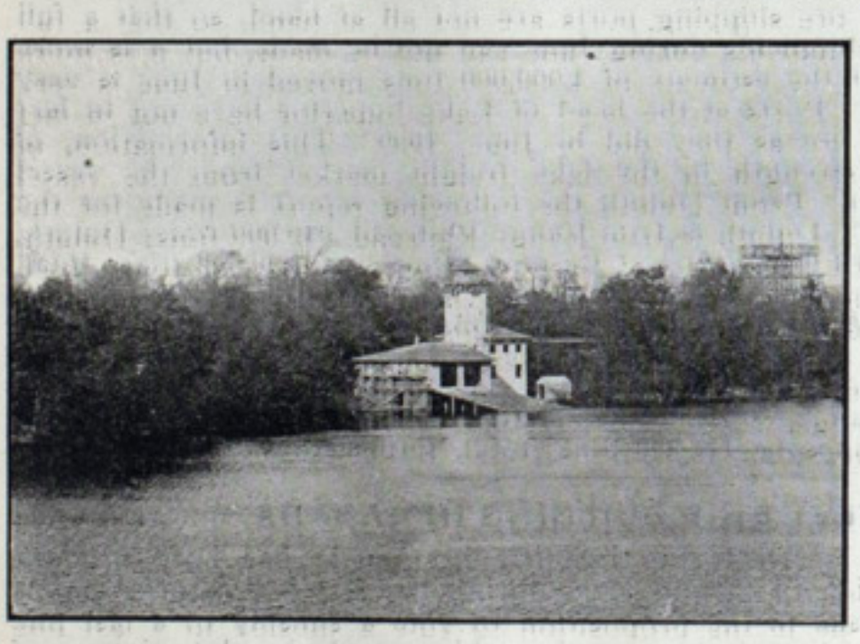
IT IS A BEAUTIFUL SHOW AND IS WELL WORTH SEEING—THE MECHANICAL DISPLAY IS EXCELLENT.

LAKE ERIE.

The distinctive feature of the Pan-American exposition is not maritime by any means. There is very little of marine display beyond the models of the battleships and cruisers of the United States navy. These models have been to exposition after exposition, both at home and abroad, and are pretty familiar by this time. They were made in the navy yard at Washington and when not at expositions are to be seen in the corridor of the navy building at the capital. The exposition, however, is rich in its maritime statuary. The great lakes furnished inspiration to a number of sculptors. That of Lake Superior, an Indian pouring down a mighty stream of water, is typical of the great father of the lakes. Lake Erie is represented in lighter mood and with a gentler touch. The drawing of the one is vigorous and in the other quite refined.

The exposition triumphs from the architectural standpoint. Beginning at the south and going north the whole thing rises on one slowly and with grand effect. Through a fine forecourt, lined along the sides with tall pillars and headed by a heroic equestrian statue of George Washington, one crosses the great triumphal causeway over the canal which surrounds the main court. This causeway leads to the esplande, the greatest open space in the grounds, capable of holding more than 200,000 persons without discomfort from overcrowding. Beyond the esplanade is the court of fountains, and beyond that the great electric tower, which, with the propylaea behind it, forms the whole scheme. At either end of the esplanade stands one of the great buildings with the others ranged along the sides of the court of fountains up to the mall, just back of the electric tower. The prevailing tone is a soft greenish blue, more pleasant to the eye than the glaring white of the Chicago fair.

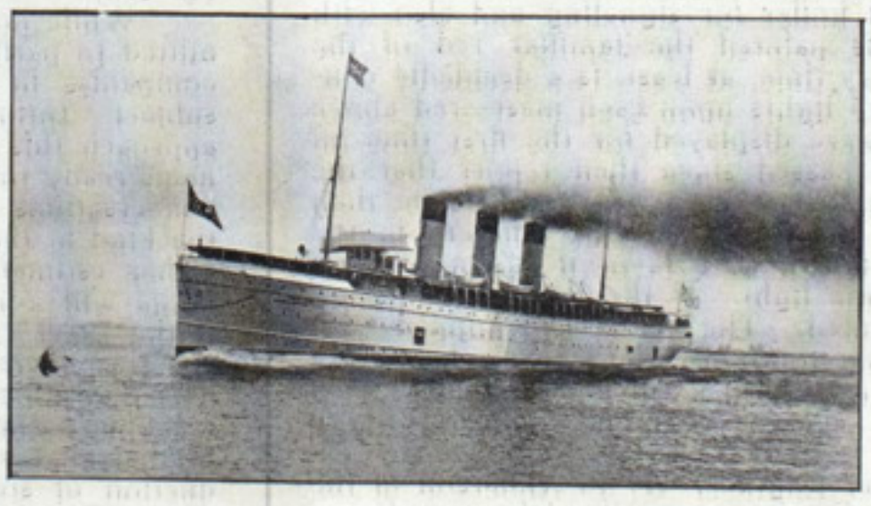
The triumphal causeway vies with the electric tower for the palm of popular admiration. The causeway is adorned with four huge pillars, surrounded by a very effective arrangement of sculpture and surmounted by heroic equestrian figures which give a singularly striking effect to the whole. The four pylors are inscribed to civic virtue, benevolence, justice and freedom. At the right of the esplande from the triumphal causeway is the government building. From each side of the government building a curved colonnade leads forward to the fisheries building on the south, and a building devoted partly to exhibits of the island possessions. At the west end of the esplanade stands the beautiful horticultural building.



THE LIFE SAVING STATION AT THE EXPOSITION.

PARK LAKE AT THE EXPOSITION.

NORTH BAY AT THE EXPOSITION.



THE NORTHLAND.

Colonnades similar to those on the east lead from it to the mines building on the south and graphic arts on the north. At the southern end of the court of fountains stand east and west respectively the ethnology building and temple of music. Ranging along the court are the manufactures and liberal arts and the agriculture building on the east with machinery and transportation and electricity on the west. This in brief is the ground plan of the exhibition.

The exposition has the vast energy of Niagara Falls at its back and transforms a great part of it into light every night. No such scheme of lighting has ever been possible heretofore. More than 5,000 H. P. is used in this work, and over 200,000 incandescent lamps are burned. They are set about the buildings in lines, in loops and bunches. Forty-four thousand of them adorn the electric tower, 11,000 on each side. No such electrical display has ever been seen before, for the simple reason that never before has such an opportunity been afforded.

The exposition is rich in its exhibition of machine tools and mechanical appliances. The Buffalo Forge Co. has a fine exhibit. It consists mainly of four fans, one on top of the other. The lower one is of immense proportions and the four together reach to a great height and attract much attention. Several high speed engines are also shown. The American Blower Co. has a very interesting exhibit of fans, blowers and heating coils. The Philadelphia Pneumatic Tool Co. has an air compressor plant and several pneumatic riveters and hammers which can be tested by visitors. The Lidgerwood Manufacturing Co. shows a 50 H. P. mining hoist, a bridge erecting hoisting engine having four independent winches, and a heavy mining hoist having a 50-in. drum. A special working exhibit is also made by the Chicago Pneumatic Tool Co., and in connection with it is the display of the Champion Rivet Co. of Cleveland.

A distinctive feature of the machine display is the large number of machines which are to be seen in actual operation. A steel superstructure is built over many of the exhibition booths which carries power transmission machinery and the machines are suitably placed so that they can be operated at will. As a rule the exhibitors have their line shafting connected to motors which are exhibited by the builders. A number of the machines have independent motors attached. In certain instances there is keen rivalry among the various exhibitors in showing off the productive capacity of their tools, and this lends spirit to the display and is of much practical benefit to those interested. There are a number of machines also which are new and are making their debut before the mechanical public. Altogether the mechanical exhibit is very good.

THE GREAT LAKES.

Among the concerns represented at the exposition are the following:

Diamond Drill & Machine Co., Birdsboro, Pa.; L. S. Heald & Son, Barre, Mass.; Diamond Machine Co., Providence, R. I.; Patterson Tool & Supply Co., Dayton, O.; Jacobson Machine & Mfg Co., Warren, Pa.; American Tool & Machine Co., Boston; Faneuil Watch Tool Co., Boston; Warner & Swasey Co., Cleveland; Chisholm & Moore Mfg. Co., Cleveland; Washburn Shops, Polytechnic Institute, Worcester, Mass.; Bradford Machine Tool Co., Cincinnati; American Steel & Wire Co., New York; National Tube Co., New York; Western Tube Co., New York; Shelby Steel Tube Co., New York; Vulcan Iron Works, Chicago; Hall Iron Works, Lockport, N. Y.; Taylor Bros. Iron & Steel Co., High Bridge, N. J.; Cleveland Wire Spring Co., Cleveland; Contractors' Plant Mfg. Co., Buffalo; Lidgerwood Mfg. Co., Brooklyn; Henry R. Worthington, Brooklyn; Deane Steam Pump Co., Holyoke, Mass.; Cameron Steam Pump Co., New York; Otto Gas Engine Works, Philadelphia; Rider Ericsson Engine Co., New York; A. Mietz, New York, builder of the Mietz & Weiss gas and kerosene engine; Pennsylvania Iron Works Co., Philadelphia; Rand Drill Co., New York; J. B. & J. M. Cornell, New York; Walworth Mfg. Co., Boston; Fuel Economizer Co., Matteawan, N. Y.; Powers Regulator Co., Chicago; Merrell Mfg. Co., Toledo; Fox Machine Co., Grand Rapids, Mich.; H. B. Smith Machine Co., Smithville, N. J.; Lancaster Machine & Knife Works, Lancaster, N. Y.; Carborundum Co., Niagara Falls, N. Y.; Bickford & Francis Belting Co., Buffalo; Charles Schieren & Co., New York; J. B. Hoyt & Co., New York; Chicago Belting Co., Chicago; New York Leather Belting Co., New York; Boston Belting Co., New York; New York Belting & Packing Co., New York; Fayerweather & Ladew, New York; Peerless Belt Lacing Machine Co., Philadelphia; American Pulley Co., Philadelphia; Oneida Steel Pulley Co., Oneida, N. Y.; Forester Pulley Works, Fairport, N. Y.; Reeves Pulley Co., Columbus; Cling-Surface Mfg. Co., Buffalo; Robins Conveying Belt Co., New York; Morse Twist Drill & Machine Co., New Bedford, Mass.; Cleveland Twist Drill Co., Cleveland; Standard Tool Co., Cleveland; J. H. Williams & Co., Brooklyn; E. C. Atkins & Co., Indianapolis; Blodgett Mfg. Co., Rochester; L. & I. J. White Co., Buffalo; Whitney Mfg. Co., Hartford, Conn.; Hickman-Melhorn Co., Pittsburg; Foos Mfg.

Co., Springfield, O.; Lamb & Ritchie, Cambridgeport, Mass.; E. & B. Holmes Machinery Co., Buffalo; S. R. Dresser, Bradford, Pa.; Neemes Bros. Shear-Cutting Grate Works, Troy, N. Y.; American Grate Bar Co., Buffalo; Hoggson & Pettis Mfg. Co., New Haven, Conn.; Builders' Iron Foundry, Providence, R. I.; Goodwin Car Co., New York; Oneida National Chuck Co., Oneida, N. Y.; Mine & Smelter Supply Co., Denver; Midgley Mfg. Co., Columbus; Bryden Horse Shoe Co., Catasauqua, Pa.; Hay-Budden Mfg. Co., Brooklyn; Cochran Co., Lorain, O.

THE NEW SHIPPING BILL.

The shipping bill, which was the subject of protracted debate in the last congress, will be brought up by its friends early in the fifty-seventh congress with redoubled energy and determination. It is understood that Senator Frye's views have undergone no little change in consequence of the opposition that was shown to the Hanna-Payne bill during the debate last winter. The real battle ground where the subsidy question must again be fought out is the house, and there it is known that a determined handful of thoroughly well-informed and independent members are ready to antagonize the Hanna-Payne bill. The new measure, which has not yet been made public, will be introduced by some western representative. The distinctive features will be the entire rejection of the speed basis of subsidy payments and the absolute disbarment of foreign bottoms from participation in the subsidy.

LAKE SUPERIOR.

The proposed bill provides a ten-years subsidy period, and calls for rigid inspection of vessels enjoying the subsidy. The gradual employment of American sailors is insisted on. During the first three years one-fourth of the crew, the next three years one-third, and the last four years one-half must be Americans. The Hanna-Payne bill was loosely drawn in this respect. It provided that a certain percentage of the crew should be American, unless an American consul in a foreign port should certify that Americans could not well be procured, and then the master of the ship was at liberty to hire the cheapest labor he could find. Every one at all familiar with the practice of vessel owners knows what the result would be. The large transpacific freight steamers run by American transcontinental roads are now paying $12 and $14 a month, Mexican silver, for coolie firemen, a practice which is never likely to produce American sailors or afford anv inducement or protection to Americans who might desire to take up a seafaring life.

The bill excludes positively all vessels peculiarly constructed for carrying liquid cargo. This is meant to apply to the tank steamers run by the Standard Oil Co. Under the Hanna-Payne bill the Standard Oil vessels could have drawn subsidy. Their tonnage aggregated 118,000 tons. Provision is made for vessels running on the great lakes, the subsidy being payable only on ocean mileage. The Hanna-Payne bill did not cover this. The bill permits American register for foreign-built ships purchased by the government during the Spanish-American war when sold to American purchasers. All vessels enjoying subsidy are to carry the mails free. Subsidized vessels are also subject to acquisition by the United States government in time of war.

The Sherman anti-trust law is made applicable to all contracts for subsidy. The most important section of the bill applies to the trusts. This is substantially the same as the Stevens amendment presented last year with a view to preventing ship trusts from being organized with a view to controlling freight rates, docks and terminal points. It is claimed on this score that there is also a danger in combinations being formed by ship owners and ship yards to make it too expensive to build American ships, the idea being that the fewer ships there are the greater the enjoyment of the subsidy.

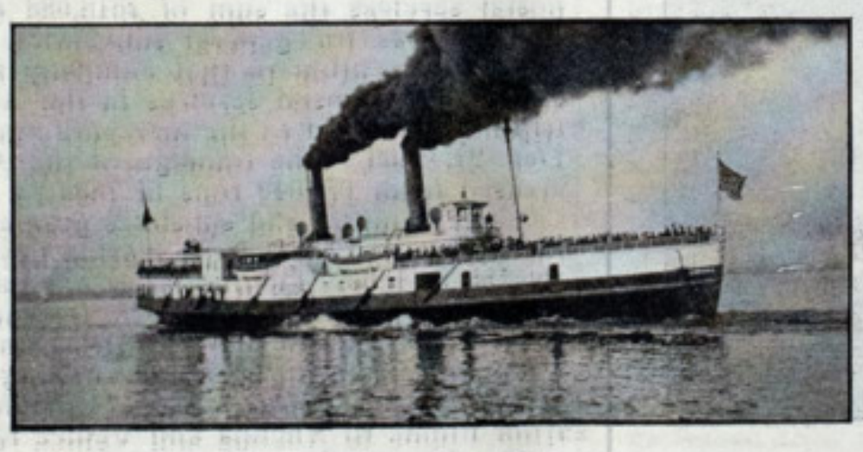
The fundamental objection to this bill will be the fact that it rejects the speed basis subsidy. Its authors, however, believe that they have taken the broad patriotic ground, and that the country will accept their proposition as a reasonable one. Subsidy for speed must be paid in proportion to the knots made per hour in order to be equitable to all vessels drawing the subsidy, and the subsidy must be increased as the rate of speed increases. The cargo theory of subsidy comes more nearly to a fair basis. A cargo steamer of 12 knots can be taken to Liverpool with a daily consumption of forty-five tons of coal and a force of twelve or fifteen firemen. The 21-knot boat burns 300 tons daily in sailing the same distance and carries 127 firemen. The new bill carries the freight theory of subsidy so far as to include sailing ships. To build and operate a sailing ship the cost is about one-third of that of a steamship of the same tonnage. The bill, therefore, proposes paying sailing ships 33 1-3 per cent. of the amount of subsidy proposed for steamers. The new bill cuts the subsidy period down from twenty to ten years, and the whole annual payment from $9,000,000 to $5,000,000. The period during which contracts can be made under the proposed bill expires July 1, 1902. No ship over twenty years old can be eligible for subsidy. There are vessels registered for subsidy under the Hanna-Payne bill that are forty years old and which would be sixty years old at the end of the subsidy period.

FRENCH NAVAL MANEUVERS.

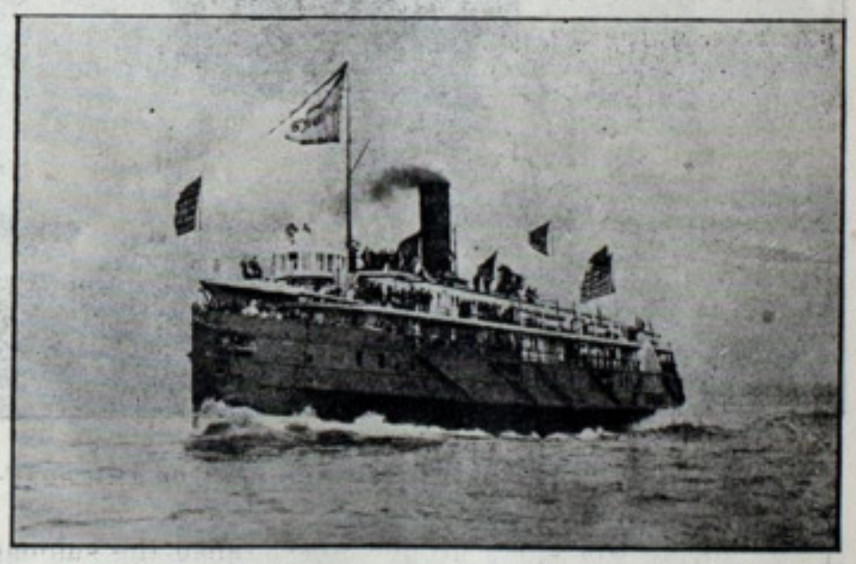
The French naval maneuvers during the present year will be conducted on a more comprehensive scale than has hitherto been attempted. The present program provides for a considerably wider range of action, comprising the vast triangle with a line drawn from Corsica to Bizerta as a base, and the straits of Gibraltar as an apex. The importance of these operations lies in the fact that a mastery over this triangular end of the Mediterranean is the starting point of French naval strategy. The fleet, under the command of Admiral Gervais, will be composed of the Mediterranean and northern squadrons. The Mediterranean squadron will comprise the battleships Bouvet, Saint-Louis, Charlemagne, Gaulois, Charles-Martel, Jauréguibery, with the addition of the Brennus, the armored cruisers Pothuau, Chanzy, and Latouche-Tréville, the protected cruisers Du Chayla, Cassard, Galilée, Lavoisier, and Linois, and seven destroyers and torpedo boats. The northern squadron will consist of the battleships Masséna, Carnot, Admiral Baudin, Formidable, Courbet, Hoche, and the coast defense battleships Tréhouart and Bouvines, the armored cruisers Dupuy-de-Lôme and Bruix, the protected cruisers D'Assas and Surcouf, and five destroyers. There will also be a number of coast defence vessels from Toulon, Corsica, Algeria, and Bizerta. Without counting these there will be fifteen squadron and coast defence battleships, five armored cruisers, seven protected cruisers, and twelve destroyers and sea-going torpedo boats.

It will be noticed in the composition of the squadrons that the proportion of cruisers to battleships is about the same as last year, but it is hoped to make a much more effective use of the cruisers by the aid of wireless telegraphy. Instead of playing a predominant part, as advocated by the new school, they will continue to serve as scouts; but their range will be considerably increased by the facility of communication with the battleships from a distance. The experiments will show up to what distance this communication can be carried out by wireless telegraphy; and it is expected that very valuable results will be obtained in the way of enabling the battleships to follow the movements of an enemy. Admiral Gervais is also giving special attention to the coaling of ships. The northern squadron will be accompanied from Brest to the Mediterranean by a couple of big steam colliers, and coal will be taken in on the way, and when the two squadrons return to Toulon on July 9th, an experiment will be carried out of coaling all the vessels in the shortest possible time. Special arrangements are being made for this in the hope of establishing a record.

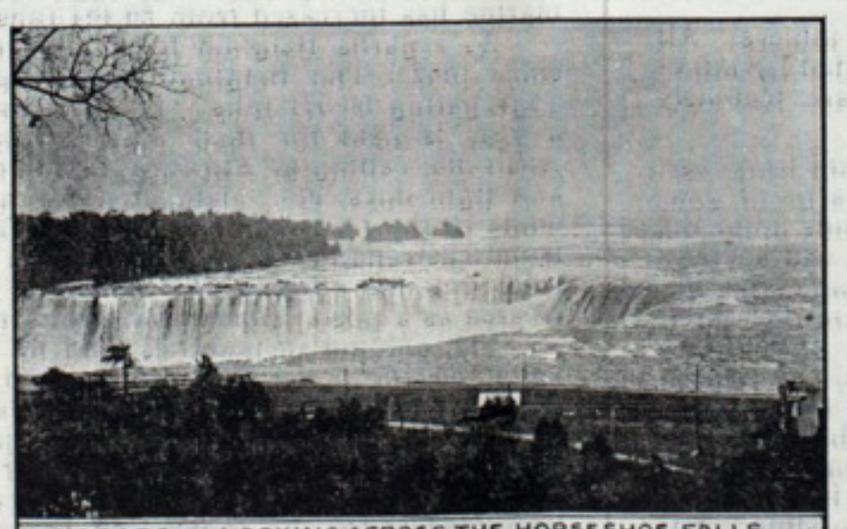
In the month of June 149 vessels of all kinds, aggregating 41,496 gross tons, were built throughout the United States. Ninety-five of the vessels, aggregating 21,063 tons, were built on the Atlantic and Gulf coasts, twelve of 15,205 tons on the great lakes, sixteen of 4,463 tons on the Pacific coast and twenty-six of 765 tons on western rivers. The lake list includes three large steamers—the Gilchrist of 3,871 tons, the Frank H. Peavey of 5,002 tons and Mary E. Elphicke of 4,998 tons. The only large steamer in the Atlantic coast list is the North Star of 3,159 tons, built at the Roach Ship Yard, Chester, Pa. The Standard Oil Co.'s sailing vessel, Acme, built at Bath, Me., registers 3,288 tons.



THE CHICORA.



A TYPICAL LAKE BOAT.



NIAGARA — LOOKING ACROSS THE HORSESHOE FALLS.

THE LIBERAL ARTS BUILDING.

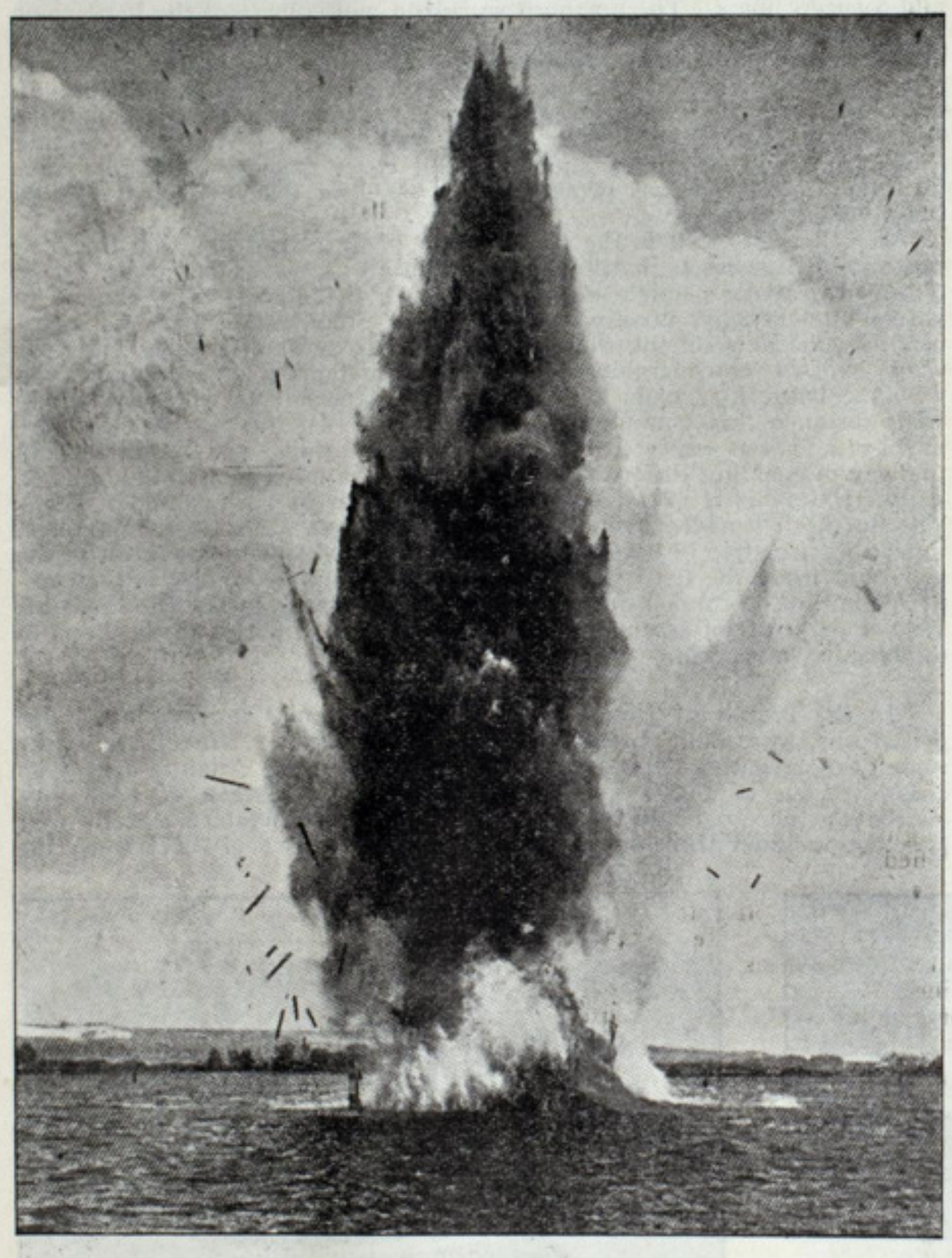
PAN-AMERICAN EXPOSITION VIEWS.

Very low rates to San Francisco via B. & O., account Epworth League. Tickets on sale July 5 to 12. Available for return to August 31. For particulars call city ticket office, 241 Superior street. July 4.

DESTRUCTIVE QUALITY OF SUBMARINE MINES.

Whether or not the Maine was blown up by an internal or external explosion will very probably be known, a little later on, if the firm of N. F. Chamberlain & Co. of Chicago begin work, as they say they will, on their contract to remove the vessel. Their plan is to build a cofferdam about the sunken battleship for the purpose of raising her. The water will first be pumped out, the holes in her sides and bottom closed and the battleship floated. Should it prove to be an external explosion it will offer graphic evidence of the force of submarine mines. During the war with Spain much was published regarding the destructive qualities of these mines, but no opportunity was afforded during actual conflict to test them. A series of experiments, however, have lately been conducted in England which gave some idea to the layman through photography of the terrific nature of these explosions. Navy and Army Illustrated of London has just published an article upon submarine mines and their uses which the Review takes pleasure in reproducing in part:

"Submarine mining is a general term used to designate the various systems of offensive and defensive under-water warfare which a maritime nation might employ in its operation against an enemy. Offensive mining is exclusively a naval weapon, and defensive mining almost exclusively military, for though a fleet carries a small proportion of stores for the defence of a harbor, it is to be hoped that our navy, at any rate, will never be in a position which requires a retreat behind a temporary mine-field. Military mining is in the hands of the royal engineers, who have a corps



ONLY SPLINTERS WERE LEFT OF THE BOAT.

of men specially trained for the work, called the submarine miners. All the more important harbors throughout the empire are defended by mine-fields, whose unobtrusive, and often unsuspected, secrets are jealously guarded.

"To begin at the beginning, a mine is a water-tight buoyant iron case, generally spherical or conical in shape, which contains a charge of gun-cotton. This charge is of various sizes, and its weight depends upon the special work for which the mine is designed. A contact mine will average about 100 lbs. of gun-cotton, and an observation mine about 500 lbs. The contact mine, as its name implies, floats near the surface of the water, and is fired automatically if a ship bumps against it. The observation mine, on the other hand, lies 30 ft. or 40 ft. below the surface, and is fired by one or more observers on shore, who follow the course of the enemy's ship, and fire the mine when she is observed to be over it. Both kinds of mine are, of course, moored in position by means of anchors or heavy sinkers. Both kinds of mine, too, are fired by electricity; indeed, it is only by the use of electricity that the modern mine-field is possible. Advantage is taken of the fact that a current of electricity flowing along a wire raises the temperature of that wire by reason of the resistance which the wire offers to the passage of the current. If the wire is large the resistance is small, and the rise of temperature is inappreciable; but if at any point in this circuit the wire is made so small that its resistance to the passage of the current is very high, then the temperature rises, the wire becomes red-hot, and eventually fuses. Such a piece of wire about a quarter of an inch long and surrounded by gunpowder constitutes an electric fuse. The battery for generating the electric current is kept on shore. To each of the mines a cable is laid which is of sufficient size to carry the battery current without heating. Inside the mine it is connected to the fuse. Directly the current is allowed to pass the fine wire inside, the fuse gets red-hot and ignites the powder round it, which, in turn, explodes the mine.

"A well-planned and efficient mine-field will be a most difficult thing for a fleet to attack. The shore stations are so small, and so easily concealed, and the destruction wrought by a mine upon a ship is so certain, that any man would think twice before attacking a place so defended. In the ideal harbor the mine-field lies well to seaward of the forts and the main positions to be held, so that to attack successfully the enemy must first cross the mined area before he can get to close quarters with those inside the harbor. At the same time, the mine-field is thoroughly well protected by light gun-fire against any boats that may be sent in to cut the electric cables or destroy the mines. The usual plan adopted is to sow the mouth of the harbor with contact mines, keeping a central channel defended by the deep-lying observation mines. By this means friendly ships can go in and out without fear of fouling the contact mines. Even if they did touch one, however, there would be no danger, for the great advantage of these electrically-fired mines is that when the batteries ashore are disconnected the mines are perfectly harmless.

"There is another kind of contact mine which is also sometimes used, called the mechanical mine. It would never be used for defensive purposes except as a last resource. It is fired by means of a pistol or friction arrangement contained in the mine, and obviously, when once laid down, it is as dangerous to friend as to foe. When these mines have been laid on active service, and it has become necessary afterwards to raise or destroy them, the work of doing so has nearly always been attended with considerable loss of life to those employed on the work. The proper sphere of the mechanical mine is for offensive work, and, as such, finds a place among naval mines. It is conceivable that it might be made very useful under some circumstances. A gunboat or other swift light-draught vessel, armed with a dozen or so of these mines arranged to drop and moor themselves automatically at the proper depth, could make a night raid upon an enemy's harbor, a favorite anchorage, or some narrow channel used by him, and drop the mines there. The result could not fail to have a disquieting effect upon the enemy.

"The other offensive operations which would be practiced by a naval force in connection with mining are: (1) Creeping with hooks and grapnels for electrical cables connected to the mines, cutting them as found, and so rendering the mines harmless; (2) sweeping with heavy chains, dragged between small steamers, across the mine-field and so displacing or destroying the mines; (3) countermining, or destroying the mine-field wholesale, by the use of enormous charges of gun-cotton."

SUBSIDIES OF NATIONS.

THE BRITISH GOVERNMENT ASCERTAINING EXACTLY HOW MUCH MONEY IS PAID OUT FOR BOUNTY PURPOSES TO SHIPPING.

The British government has just published reports from its consuls regarding the shipping bounties of various countries. The compilation was made as a direct result of an inquiry from Lord Salisbury to the consuls. The reports deal with Austria-Hungary, Belgium, France, Germany, Italy, Japan, the Netherlands, Russia and Sweden and Norway. The inquiry is particularly interesting to the United States as a new bill to financially encourage shipping has been drafted to be presented to congress next December. From the British report the following particulars are taken:

In 1899 the Austrian government paid in bounties and for general postal services the sum of £318,988 (against £50,468 in 1890), of which £242,500 was for general subvention to the Austrian-Lloyd, £5,000 for special subvention to that company for parcel post services, £17,208 for subsidies for postal services in the Adriatic, and £54,280 for trading and trip bounties paid to the mercantile marine in accordance with the law of Dec. 27, 1893. The tonnage of the Austrian sea-going shipping has increased from 176,042 tons in 1890 to 196,909 tons in 1899.

The bounties and subsidies granted by the Hungarian government to the Hungarian mercantile marine have increased from £63,791 in 1890 to £80,755 in 1899. Of this latter amount £47,500 was earned by the Royal Hungarian Sea Navigation Co. for running lines respectively from Fiume to Western Europe, North Africa and Brazil; £16,083 by the Hungaro-Croatian Steamship Co. for running lines to the Hungaro-Croatian, Istrian and Dalmatian coasts; £4,166 by the Schwarz line for running ships from Fiume to Ancona and Venice respectively; and £7,500 by the Hungarian-Levant Steamship Co. for running ships from Galatz to Black sea and eastern ports. The total tonnage of the Hungarian mercantile marine has increased from 53,484 tons in 1890 to 62,777 tons in 1898.

As regards Belgium it is stated that no bounties have been granted since 1852. The Belgium mercantile fleet consists of sixty-six vessels, aggregating 90,971 tons. To the Norddeutscher Lloyd of Bremen £3,200 a year is paid for their vessels from Bremerhaven to East Asia and Australia, calling at Antwerp, in addition to the repayment of all pilotage and light-dues, etc., claimed from the company by Belgian authorities; while to the Deutsche-Australische Co. £60 is paid for each journey to or from Australia in the course of which their vessels touch at Antwerp. The total amount allowed for subsidies is £4,800, but this sum should be treated as a postal subvention rather than a bounty.

The amount of bounties paid by France has increased from £461,641 (£122,180 for construction and £339,461 for navigation—tonnage and mileage) in 1889 to £648,000 (£196,000 for construction and £452,000 for navigation) in 1900, and the subvention for postal services from £962,259 to £1,067,271 in the same period. Of the latter figure for postal services £14,200 was for the France and Corsica line, £54,066 for the Mediterranean line, £10,000 for the Calais and Dover line, £450,320 for the New York, West Indies and Mexico line, £243,347 for the Indo-China and Japan line, £74,000 for the Algeria, Tunis, Tripoli and Morocco line, £124,317 for the Australia and New Caledonia line, £76,985 for the East Africa and Indian Ocean line, and £20,036 for the West Coast of Africa line. The French mercantile marine has increased from 15,194 vessels, of 932,735 tons net, in 1889, to 15,489 vessels, of 957,755 tons net, in 1899.

Sir F. Lascelles in dealing with German bounties points out that the annual sums granted as postal subventions in Germany cannot be regarded merely as a payment for services rendered, as the sums were asked "for establishing and subsidising German mail steamers between German ports and Australia, Eastern Asia and Africa." The bounties paid by

Germany in 1889 amounted to £200,000, and in 1898 to £325,000, but this is exclusive of about £65,000 per annum paid by the German post office to the Hamburg-American and Norddeutscher Lloyd companies for the carriage of the German mails respectively from Hamburg and Bremen to America. The Norddeutscher Lloyd got £165,000 in 1898 for its fast Asia line, and £115,000 for its Australia line; the German East Africa line received £45,000 (from Jan. 1 last the sum will be £67,500 per annum). The German government also grants largely reduced rates of carriage by all German state railways to goods exported from inland places of Germany on through bills of lading, and this is equivalent to an indirect bounty. The tonnage of German merchant ships has increased from 1,320,721 tons net in 1889 to 1,639,552 tons in 1898.

From Jan. 1 last Italian steamers of Italian construction are to receive 40 centimes per ton per 1,000 miles completed by them up to the fifteenth year after their construction, and Italian-built sailing ships 20 centimes per ton per 1,000 miles up to the twenty-first year after their construction. The yearly distances traveled, on which premiums will be paid, may not exceed 32,000 miles for steamers with a less speed than 12 miles an hour, 40,000 for vessels traveling from 12 to 15 miles, 50,000 for those with a greater speed than 15 miles, and 10,000 for sailing ships. Ships of foreign construction are not entitled to any navigation premium. On the hulls of vessels built in Italy 45 lire per gross ton is to be paid as a construction bounty where the vessel does not exceed 12 miles an hour, for vessels of from 12 to 15 miles the bounty is to be 50 lire, and exceeding 15 miles 55 lire. On marine engines constructed in Italy the bounty is 12.50 lire per unit of horse power, on boilers 9.50 lire per quintal, and on subsidiary apparatus 11 lire per quintal. In no year is the allowance for bounty to exceed 10,000,000 lire. The above law materially reduced the bounties on navigation and hull construction granted by the law of July 23, 1896, the bounties on engines, boilers and subsidiary apparatus being the same under both laws.

The amount of bounty granted by Japan to shipping, whether as subsidy for postal services or otherwise, has increased from £153,563 in 1890 to £584,696 in 1899. The bounty for sundry coasting services is £88,000, for the Yokohama-Melbourne line £52,565, Yokohama-Bombay £19,210, Nugata-Vladivostock £2,717, Hakodate-Korsakoff £2,136, Shanghai-Hankow £9,040, Hankow-Ichang £5,914, Japan-Europe £267,389, Hong Kong-Seattle £65,403, and Hong Kong-San Francisco £101,388. For a Japanese ship of 1,000 tons burden and steaming 10 knots per hour the bounty is 6d. per 1,000 miles per gross ton, 10 per cent. extra for every additional 500 tons and 20 per cent. for every additional knot in speed until the limit of 6,000 tons and 17 knots is reached. The foreign-built tonnage owned by Japan has increased from 1,407 vessels of 143,068 tons in 1889 to 1,684 vessels of 318,394 tons in 1897.

The Netherlands government gives neither bounties nor subsidies to shipping but merely an indemnity for the regular transport of mails and parcels. For the services of the Royal Packet-Boat Co. the Netherlands Indian government paid £54,215 in 1891 and £57,060 in 1898; the Steam Navigation Co., Zeeland, was paid £25,161 in 1889 for letters and parcels transport, and £36,694 in 1898; the Steam Navigation Co., Netherlands, £13,429 in 1889 and £17,537 in 1898; and the Rotterdam-Lloyd £2,738 in 1889 and £18,443 in 1898.

The amount of bounty granted to Russian shipping as subsidy for the transport of troops, ammunition and passengers amounted in 1899 to £318,061, of which £127,500 went to the Russian volunteer fleet, £90,312 to the Black Sea Navigation Co., £33,256 to the Black Sea Danube Navigation Co., £29,856 to the Archangel-Murman Navigation Co., £19,500 to the Amur Navigation Co., £637 to Feodoroff's steamers at Vladivostock, £1,062 to Petchora steamers between Archangel and the Petchora, and £15,938 to Sheveleff's steamers in the North Pacific. These sums include the return of the Suez canal dues. For postal services £46,695 was paid. The sum assigned in 1901 for the encouragement of Russian navigation amounted to £327,895, showing a slight increase on 1899. The total tonnage of Russian shipping at the ports of the White, Baltic, Black, Azoff and Caspian seas and in the foreign sea-borne trade has increased from 528,987 tons in 1896 to 554,140 tons in 1899.

As regards Sweden and Norway the following sums were paid for the year 1898-9 for the different routes named: Christiania-Hamburg, £972 postal subvention; Christiansand-Fredikshavn, £4,072 postal subvention and £4,444 for state contribution; Christiansand-Hamburg, £444 postal subvention; Bergen-Newcastle, £2,777 postal subvention and 4,166 state contribution; Norway-Spain-Italy, £4,166 state contribution; and Stavanger-Iceland, £277 postal subvention, or a total of £9,933 postal subvention and £18,333 state contribution. In 1899 the Swedish government paid £16,818 out of postal funds as subventions to Swedish or foreign ship owners whose vessels have maintained postal routes, and £477 to the steamship company Gothland as subvention.

DEFENCE OF COALING STATIONS.

Now that the United States has a growing navy the defence of its coaling stations becomes a matter of vital concern. Upon this subject much can be learned from nations that have had to defend coaling stations as an every-day trade. Rear Admiral S. Eardley Wilmot of the British navy has just contributed an excellent article upon the subject "The Defence of Coaling Stations" as follows:

The remarks of the secretary of state for war a short time ago, that he hoped to release certain regiments from garrison duty by the admiralty taking over the defence of some of the coaling stations, much perturbed the minds of several ex-first lords of the admiralty. In the house of lords they vigorously protested against any such change in the system under which the local defence of these stations is confided to the army, and assuming that this duty would, if a substitution took place, fall to the marines, they pointed out the disadvantages of allotting the duty to this corps. As one who has long held the view that defence against sea attack should be undertaken by men with sea experience, I will endeavor to state the arguments in favor of this method. They practically cover the whole of coast defence, understanding by that term not only forts, submarine mines, and search-lights, but also craft such as guard and torpedo boats, without which the local defence of any port is incomplete. Now the stock argument against the naval department being responsible for the defence of ports is that it would hamper the fleet in performing its proper functions; that our ships should be perfectly free to assume the offensive, and act at once on the enemy's coast. Thus employed, and if able to assert a superiority at sea, they prevent an attack in force upon our own coast. Small hostile squadrons, or stray cruisers, may, however, evade our forces at sea and raid a coaling station which had no local defences. The question then becomes—Should these defences be in the hands of soldiers or sailors? In an article on coaling stations, a service journal says on this point: "The defences, such as they are, on land remain in the hands of the army, because it is the general policy of the navy that admirals commanding fleets shall not have on their minds the responsibility of the work that would be entailed upon them by the garrisoning and managing of the defence of these places. The principle involved is that a naval commander ought to be able to strike at the enemy without having to think of the safety of his bases or his coaling stations from raiders; this is left for the land forces to ensure." Here we have the argument for the present system excellently put, but it contains more than one fallacy. An admiral on a foreign station cannot divest himself of responsibility and anxiety for the safety of his coaling stations, whether they are defended by soldiers or sailors. If attacked by a force which has evaded his squadron, and a station falls into the hands of the enemy before the admiral comes to the rescue, upon whom will the principal odium fall? But the main point is what men are likely to work the weapons of local defence most efficiently, to watch for approaching vessels, to discriminate between friend and enemy when they appear, and if the latter, to know best his weak points? Would not the admiral when absent feel less anxiety about his coaling station if in the hands of men whom no artifice of the sea could deceive? In the hands of men ignorant of the sea and ships, but burning with zeal, it might be more dangerous for an admiral to approach his own harbor than that of the enemy.

We had an example of what might happen during the last naval maneuvers. Mr. Thursfield, special correspondent of the Times on board the Majestic, alludes in the new naval annual to the way in which search-lights were played on friendly ships entering harbor much to their embarrassment, and how Admiral Rawson was kept waiting for an hour outside one of his ports before the military authorities would allow him to enter. Mr. Thursfield says: "All this is amusing enough, and I have not attempted to treat it too seriously, but it has its serious side. It is at least serious enough to show that military officers are not to be trusted with the land defences of a naval port unless they possess some rudimentary knowledge of the conditions and requirements of naval warfare." How is this to be acquired? Only by service in the fleet, and hence we come to the primary condition of coast defence, that it should be in the hands of men trained to the sea. Another reason for this is that the weapons employed are for the most part familiar to them. The placing and maintaining in efficiency of submarine mines, the accompanying guard boats, working search-lights, and the handling of torpedo boats, which, combined with forts, form a complete system of harbor defence, is work for which with them no preliminary training is required. The soldier taking up such duties has to acquire in the first instance the elements of boat work, knotting, splicing, etc. There has been no question yet of the army taking over the torpedo boats; but certainly if coast defence is to be under one authority and all portions worked together, as for efficiency they should be, then logically soldiers should man the torpedo boats and free the navy—as the saying goes—still more for other work. At present I can imagine the anxiety of an officer in command of one of these craft in approaching his port at daylight in war time chased by an enemy's cruiser; whether he will be recognized by the outlying fort or treated as the advanced guard of the enemy. He is approaching the mine field. Will it be active, or made safe for a friendly vessel? A signal flutters out from the fort to stop, that his nationality may be verified, to ascertain which a guard boat is deliberately making towards him. The torpedo boat commander glances astern. The cruiser is coming up fast, hoping to sink the boat before she herself comes within range of the fort. He cannot stop to be sunk or taken, but must run on and risk the guns of his own side being turned on him, as well as the mines beneath having the safety plugs removed. There is really no time for explanations. It is a matter of ten minutes only from the time he is sighted to getting under the walls of the fort. That he reached this position in safety he always afterwards accounts a miracle. Next, it may be asked that, granted the advisability of naval coast defence, how is it to be provided? Certainly not by taking any portion of the seamen and marines who are voted and required for service in the fleet. A garrison of marines cannot defend a coaling station, and at the same time belong to a ship which, if not actually in commission, may be mobilized at any moment. Nor is it desirable that the active force of marines should be increased to a number which would allow both duties being undertaken by them. The present establishment is, or should be, of such strength that half are always serving afloat and half are on shore in barracks, the time being equally divided between these two duties. Those on shore are a reserve in case of mobilization, while those afloat are having that sea training which makes them marines not soldiers. If the numbers were increased to any considerable extent, they could not all have sufficient time at sea to acquire those attributes which now render the force so valuable. The idea of ships on a foreign station periodically embarking the marines at a coaling station and landing a corresponding number to take their place is impracticable. Hence we must seek some other method of providing these places with sea defenders, and my idea is that we should form a separate coast-defence corps from seamen and marines who have served their time in the navy, or after a certain period of service, just as now seamen can volunteer for the coastguard after eight years in the fleet. It may be objected that such a measure would diminish the numbers of those men joining the fleet reserve, but as for a naval reserve we mainly rely upon the mercantile marine and coast fishermen, I do not think the objection of great moment. Appointments in this coast-defence corps should be open to officers of the navy and marines, especially the latter, thus providing employment to the senior ranks which they now lack; while in certain instances the command of coaling stations should be conferred on them. Thus in time the army would be relieved at many places of garrison duties, and rendered more free to undertake its proper work of over-sea expeditions when required; while the coaling stations would be efficiently defended, and the navy be no less able to act offensively than it is at present.

Mr. H. M. Whitney of Boston, writing to the Review, says that there is nothing whatever in the rumors that his company is interested in any way in the establishment of a ship building plant at Sydney, N. S.

THE ROACH SHIP YARD.

A BRIEF OUTLINE OF ITS HISTORY AND A GRAPHIC SKETCH OF THAT INDOMITABLE CHARACTER, JOHN ROACH, WHO STAMPED HIS NAME UPON IRON SHIP BUILDING IN THE UNITED STATES.

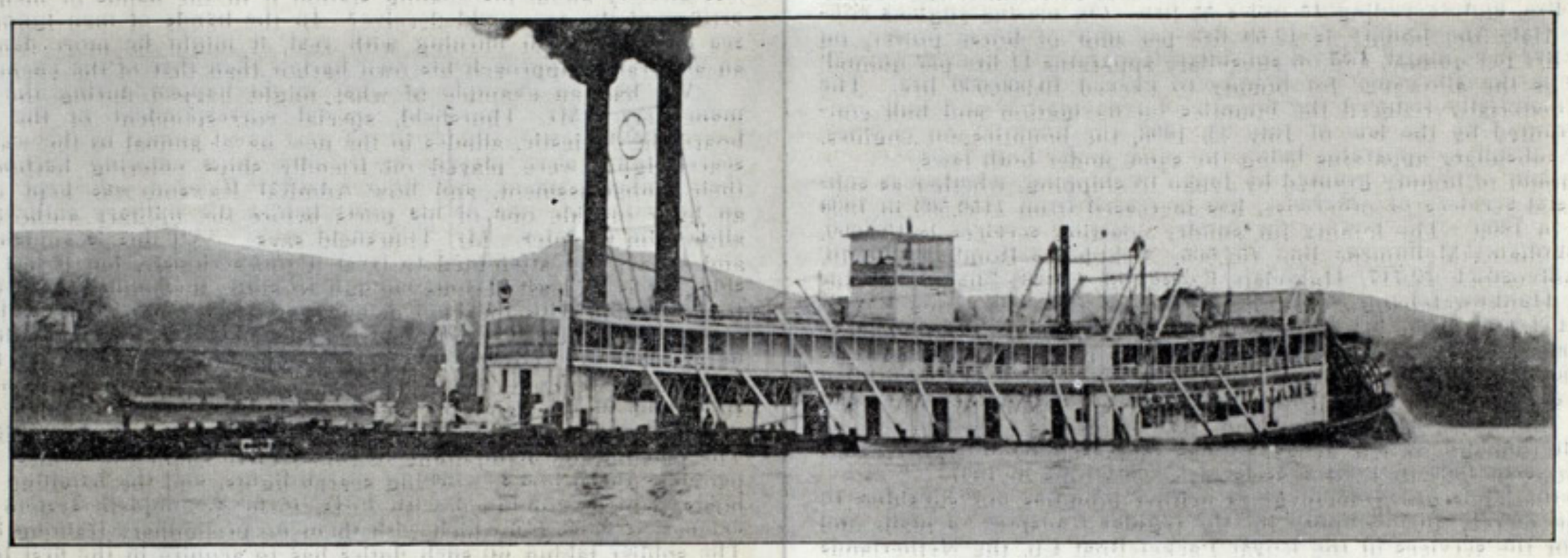
The Times of Chester, Pa., celebrated its silver anniversary last week by giving a detailed description of the industries which have made Chester famous. Of course Roach's ship yard, more formally known as the Delaware River Iron Ship Building & Engine Works, is given an extended mention, and as it is of both historical and industrial importance the Review reproduces it as follows:

In 1859 Thomas Reaney bought the tract of land where the Pennsylvania Oil Works had located a costly plant in 1855, which, destroyed by fire in 1857, was in ruins when the Reaney purchase was made. There he established a ship yard and engine works, which were known as the Pennsylvania Iron Works. At the beginning of 1860, Mr. Reaney withdrew from the firm of Reaney, Neafie & Co., and began active operations at Chester, associating his son, William B. Reaney, in the business, the firm being Reaney & Son. With the civil war the ship yard became a place of great activity, for the United States taxed the capacity of the works in repairing the vessels that had been hastily gathered together, armed and used in blockading service. In 1862 Samuel Archbold, who was a marine architect in the United States navy, resigned from the service, accepting an interest in the business, the firm then being changed to Reaney, Son & Archbold. At the yard during the war were built for the navy the monitors Sangamon, Lehigh and Junxis, the gunboat Tahoma, the double-enders Paul Jones, Wateree, Suwanee and Shamokin, and the two heavy tug boats Pinta and Nina. The Wateree, it will be remembered, on August 13, 1867, was destroyed by a tidal wave that swept her ashore at Arica, on the southern coast of Peru. Owing to the business depression of 1870 the firm was compelled to make an assignment and the plant at Chester, representing an expenditure of nearly a million of dollars, in 1871, was purchased by John Roach, for about a fourth of its original cost.

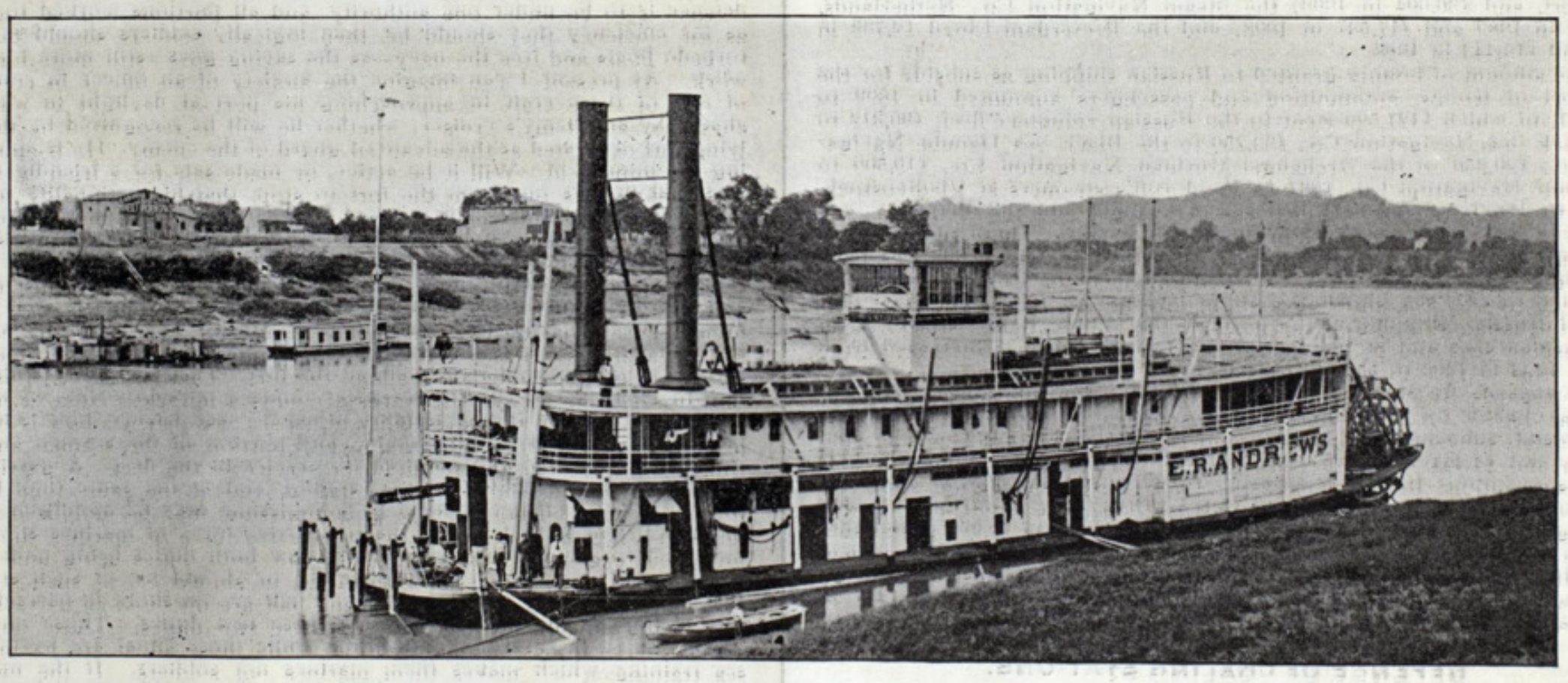
The outlook for the purchaser at that time was not propitious and it is doubtful if under any other management than that of John Roach, the establishing of the great ship building plant in Chester would have been accomplished. He possessed that characteristic energy, decision of opinion, confidence in his personal judgment and promptitude in action that are essential in carrying on to success an enterprise of magnitude. It was, however, his peculiar ability to correctly forecast coming events wherein John Roach was remarkable. Charles A. Dana, in an editorial, wrote of him "that while he was a little deaf, he had eyes all around his head." It was this peculiarity that made it possible for John Roach to win the proud title that will hold him to the fore in the industrial history of this country, "The Father of Iron Ship Building in America," while it was his efforts that have earned for Chester the distinction of being the birth place of the new navy of the United States, whose superiority to vessels built in yards of the Old World was demonstrated in the sea battles of the Spanish-American war.

The career of John Roach points a moral and teaches a lesson that cannot too often be repeated to the young, that they may model and fashion their lives after the example that is found in his, for the opportunities to rise in station and mould one's fortune are as many today as they were when John Roach, a lad of sixteen, after paying his passage to America by work on shipboard, landed in New York in 1829, friendless and practically penniless. The stripling, who had been tenderly reared, for his parents were prominent and well-to-do people in Ireland until reverse in business stripped them of their means, found employment in off-bearing in a brick yard, where in the first month he saved $7 of his wages. Then followed a mason's assistant, saving $50 from his pay, then importuning Mr. Allaire to be allowed to learn the machinist trade in the foundry, which, with the entire Allaire plant, afterwards became the property of the lad whom the foreman refused to receive as an apprentice until ordered so to do by the owner of the works, because the boy's persistency of purpose pleased him. Here he worked steadily, contributing to the whiskey fund collected among the men in the foundry, as was then a custom, but refusing to drink the liquor, lest he should acquire a habit that might operate to his disadvantage in the struggle for success. How he saved in two years $1,500 from his wages and extra pay, how he sought fortune in the far west, how his earnings were swept away by other's failures, how he worked his way by the great lakes and canals to New York, where with a wife and family depending upon him he began the struggle anew; how he rose gradually at first, how he embarked in business for himself in a foundry he purchased at a receiver's sale, and step by step mounted the ladder of fortune until he had accumulated nearly $50,000, that in a moment was swept from him by an explosion in his works, against which loss no underwriter then insured. How again he set to work to rebuild his lost fortune and how in a few years he became one of the recognized business leaders in New York city and was the owner of the Morgan Iron Works, the Neptune Works, the Franklin Forge and the Allaire Works; the latter being the plant wherein he had learned his trade thirty years before it passed into his ownership. Five years afterwards he purchased the ship yard plant at Chester, where he earned a prominent place in the history of our country, and gave an impetus to the then neglected industry of ship building in the United States that has not spent its force. The influence of an individual is the actual life of the man and the influence of John Roach is even more

Types of American River Steamboats.



STEAMER JOSEPH B. WILLIAMS, OWNED BY THE MONONGAHELA RIVER CONSOLIDATED COAL & COKE CO.



STEAMER E. B. ANDREWS, OWNED BY THE KANAWHA & OHIO CO.'S FREIGHT AND TOWING LINE.

potential today than it was when with pen and voice he advocated an American policy of protection for American ships. In the speeches made in congress during the last sessions, the arguments advanced by John Roach more than a score of years ago were in most cases favorably referred to and endorsed when the subsidy bill was under consideration. John Roach was not the mere money-maker, but he was a political economist, whose opinions have not passed away with the occasion that gave them utterance.

Early in 1872 the Delaware River Iron Ship Building & Engine Works was incorporated, the officers being John Roach, president; John B. Roach, secretary, and William Parker, treasurer. Considerable improvements were at once made to the plant, which included an area of about twenty-eight acres, much new machinery procured and additional buildings erected. The first vessel built at the yard under the new management was the City of San Antonio for the Mallory Line, the first of a score of steamships built at Chester for that company. In 1874, the mammoth steamships City of Peking and City of Tokio, the largest vessels ever built in this country at the time, and unequalled in size for fifteen years subsequent to that date, were constructed at these works. On May 18, 1874, the City of Peking was launched, fully 30,000 people witnessing that event. A notable incident is associated with the trial trip of that steamship. President Grant and his cabinet, Vice President Wilson, and a host of prominent governmental officials were guests on that occasion, and as the vessel ran considerable beyond the three nautical miles, it was the only time in all our national history when the executive heads of the government were wholly beyond the limits of the United States.

The steamship City of Para was launched at Roach's ship yard April 6, 1878. On that occasion President Hayes, his cabinet, Governor Hartranft, Admiral D. D. Porter and a host of senators, congressmen and other dignatories visited the yard in a special train from Washington to witness the launch. The train was run directly to the works, excepting the car containing the president, Senator Simon Cameron and others, which was taken to the Sixth street station, where the chief magistrate was received by Mayor Forwood, and conducted in carriages with a military escort to the ship yard, the streets leading thereto being crowded with people.

At these works many of the present vessels of the Pacific Mail, the New York and Cuba, the Old Dominion, the Savannah and the Oregon Steamship Lines have been built, while the magnificent fleet of mammoth steamboats of the Fall River Line—the Pilgrim, Puritan, Plymouth and Priscilla—were also constructed at the Roach yard. On April 14, 1883, the first iron sailing ship ever built in America was launched at this yard.

The Roach yard in 1874-5 for the first time began building vessels of war for the United States navy. The sloops Alert and Huron, each steamships of 1246 tons, were the last of the old style national armed vessels. Then followed the sectional dock Pensacola, the monitors Miantonomah and the Puritan. But the birth of the new navy of the United States came when in 1883 the keel of the famous despatch boat Dolphin was laid in the Chester yard and speedily followed by those of the splendid cruisers, Atlanta, Boston and Chicago, known as the "White Squadron." Political persecution had now selected Mr. Roach for its object of attack; bureaucratic intermeddling, incompetent inspecting officials threw obstacles in his way, and as business complications followed as the consequences of these attacks, John Roach was compelled to make an assignment in 1885. These troubles unquestionably hastened his death, which occurred on Jan. 10, 1887. The subsequent practical tests to which all the Roach-built vessels have been subjected before and during the Spanish-American war have vindicated John Roach and brought reproach upon those who maligned and persecuted him.

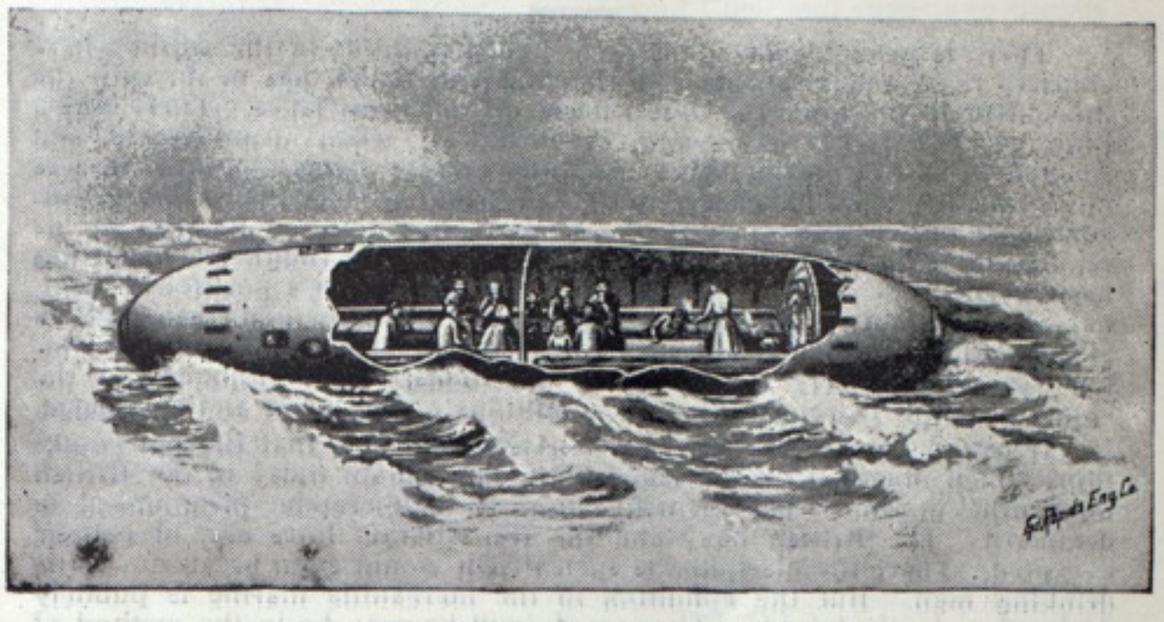
John B. Roach, in the reorganization of the company on the death of John Roach, was elected president, William Parker, secretary and treasurer, and R. Trevor Dickinson, superintendent. The new management refused to consider contracts for government work and only in one instance has that rule been departed from and that was indirectly, when N. F. Palmer & Co. of New York were awarded the contract to build the gunboats Bennington and Concord, both of which were constructed at the Roach yard.

The importance of a mammoth industry such as Roach's Ship Yard to the place wherein it is located can be best appreciated by the statement that since the establishment of the Delaware River Iron Ship Building & Engine Works, the one item of wages paid for labor alone, aggregates more than $16,000,000, the period covered representing twenty-nine years.

THE MAYO LIFE BOAT.

The Mayo life boat, manufactured by the Rescue Life Boat Co., Muskegon, Mich., is the invention of Capt. R. D. Mayo, the greater part of whose life has been spent in the life saving service of the United States government. The boat is 30 ft. long, 7 ft. in diameter and will seat fifty persons though double that number can be crowded in without endangering the boat's safety. The invention has been patented in all foreign countries and Canada and companies will be formed for manufacture of the boats in these countries. It is represented for the Mayo boat that it will not only save life but will keep its inmates in comparative comfort for an indefinite length of time. Open boats are subject to being swamped but it is claimed for the Mayo boat that it can not be swamped. One of the great difficulties of the ordinary life boat is to launch it safely. The Mayo boat need not be launched at all, as the sinking of the vessel launches the boat. The principle on which the life boat is constructed is as follows:

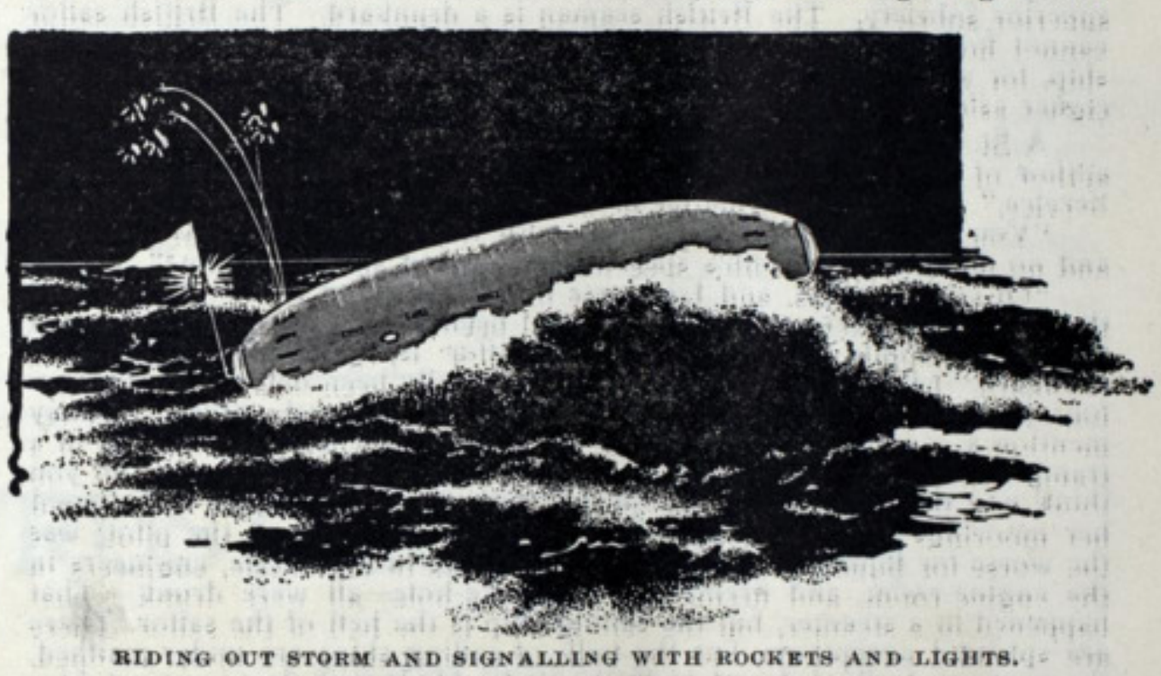
The boat itself is cylindrical in form, like an elongated barrel with rounded ends. The length of the boat is such that the action of the waves keeps the boat always parallel with them, that is, the boat always rides in the trough of the seas, and being exceedingly light, offers no resistance to heavy seas, which is its greatest safeguard, rolling onward with the seas with ease and lightness. Within the cylindrical outer shell of the boat is a hanging floor, running the length of the boat, having a seat on each side its inner length. The floor and seats hang in such manner that no matter what position the outer shell assumes the floor itself is always level or on an even keel in the bottom of the boat. It is impossible to force the floor to assume or remain in any other position, for, as the floor with the seats hangs from above, its own weight keeps it hanging from the perpendicular, and therefore absolutely level no matter what the position and what the motion of the outer shell. The body of the boat is partitioned off from both ends with an air and water space between. The boat greatly resembles a double headed fish, the openings at the end representing the mouth and the narrow gill-like openings a few feet back from the ends and all around the boat representing, and indeed looking very much like, the gills of a fish, and their purpose being precisely that of the gills of a fish from which they were



SHOWING COMPLETE INTERIOR CONSTRUCTION.

taken—that is, to let in air and water; the water, as in the case of the fish, passing back into the sea and the air passing into the body of the boat through an opening attached to the floor, by means of which this air opening is always kept in a vertical position.

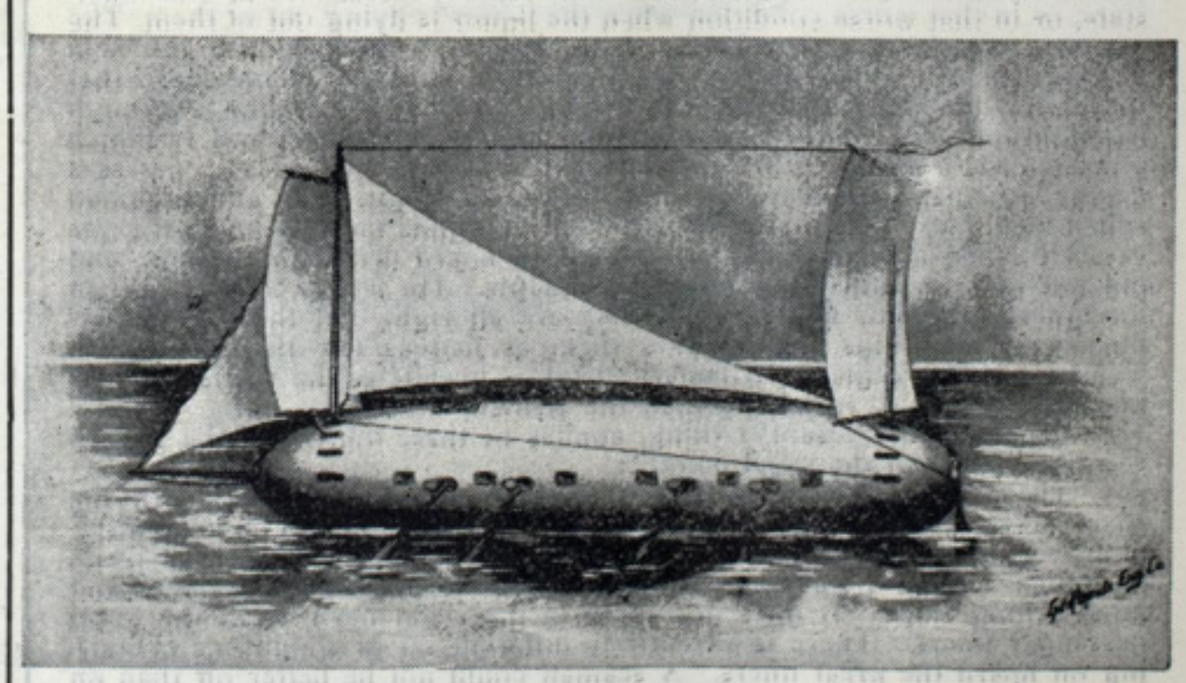
The boat is easily entered through four hatches, 24 in. high and 30 in. long. The hatches when closed seal themselves water tight. By an arrangement of thick glass bull's eyes or small circular windows light enough is admitted to the interior of the boat during the day to read by. By night candles may be used for illumination, thus avoiding danger from



RIDING OUT STORM AND SIGNALLING WITH ROCKETS AND LIGHTS.

the use of inflammable oils. Lamps using sperm or other inexplosive oils may be used without fear.

Following are some claims regarding the boat which are quoted from a descriptive circular: "Persons in the water may be picked up and saved from drowning by the use of a rope ladder dropped from the large port opening at the end. A rope may be thrown to a person in the water from this port, thus helping them to reach the boat. Provision is made for setting off sky rockets or Roman candles for distress signals. This may be done without trouble even in very rough weather. A signal flag



SAILING AND ROWING.

may be kept hoisted during the day and a light at night by means of a pole that is so arranged as to be upright all the time, regardless of the rolling of the boat. The boat may be propelled by either sail or oars when the weather is sufficiently moderate to make it desirable to do so. Should the boat receive a blow causing a leak, then the outer cylinder may be turned until the leak is overhead and kept there by locking the floor to prevent further turning and the leak repaired or stopped. Enough food and water is carried on the boat to supply the occupants for three months."

DRUNKENNESS ON BRITISH SHIPS.

IT PREVAILS TO A FRIGHTFUL EXTENT ON THE TRAMP STEAMERS AND SAILING VESSELS—PUBLIC DENUNCIATION OF A DEPLORABLE CONDITION OF AFFAIRS.

There is probably no industry of like magnitude in the world where sobriety is so much valued as in that industry which has to do with the movement of the immense vessel fleets on the great lakes. There was a time, say twenty-five years ago, or even less, when drunkenness and rowdyism ran riot on the docks, when the average sailor was more or less of a drunkard, when indeed, fighting and drinking were the ordinary concomitants of service; when the mate was often selected because of his reputation as a bully. All this is changed now. The rougher element has been weeded out. A man who drinks at all cannot get a position of ordinary responsibility. For a master of a vessel to even enter a saloon is in some of the lines equivalent to his discharge. Those same powerful influences which today are directing the industrial development of the country sought to remedy the old conditions on the lakes and succeeded.

It would seem, however, in fact it is not denied, that the old conditions which obtained on the lakes years ago, obtain today in the British mercantile marine. The British sailor is deliberately pronounced a drunkard. The British navy and the transatlantic lines are, of course, excepted. There the discipline is such that it would soon break down the drinking man. But the condition of the mercantile marine is publicly declared to be deplorable. The remedy will have to be in the method of recruiting. Sailors for the mercantile marine will have to come from the villages and farms and not from the slums of the city. The following from Fairplay, which is in itself a reprint from a daily paper, illustrates the point:

In Liverpool the other day at a meeting of the Marine Service Association Capt. Lamb, a shipmaster of twenty-six years' experience on the Atlantic, made a speech which, it would seem from the newspaper reports, dropped like a bolt from the blue among the members. The gist of what Capt. Lamb said may be summed up in the following paragraph: "Although I hate all foreigners I prefer them as seamen because of their superior sobriety. The British seaman is a drunkard. The British sailor cannot hold his own because of drink. It is not a question of seamanship, for when he is sober he can be depended upon and can put the foreigner aside, but nine-tenths of the British sailors are drunkards."

A St. James' representative has had a talk with Mr. Frank T. Bullen, author of "The Cruise of the Cachalot" and "The Men of the Merchant Service," on the subject matter of this speech.

"You are familiar, if anyone is, with the British sailor, Mr. Bullen, and no doubt Capt. Lamb's speech has engaged your attention?"

"Of course it has, and I endorse it. He is about right. I have said the same thing over and over again, and been abused for my pains; but it is true, unhappily true. The British sailor is, generally speaking, a drunkard. I have known ships that have actually been delayed for twenty-four hours in port because the crew were all helplessly drunk. I may mention a case which happened in my own experience. It was that of a tramp steamer. She sailed out of the port of London. Now, what do you think was the state of matters on board that vessel? When she slipped her moorings every man on board, with the exception of the pilot, was the worse for liquor. Officers on deck, sailors in the fo'csle, engineers in the engine-room, and firemen in the stoke-hole—all were drunk. That happened in a steamer, but the sailing ship is the hell of the sailor. There are splendid exceptions, but the bulk of sailing ships are under-manned, the men are badly fed and badly housed. Undermanning in steamships does not matter so much, but it is a serious affair where huge stretches of canvas have to be dealt with."

"And the British sailor, you think, is quite as bad as he is painted?"

"I do not exaggerate. There is no occasion for it. There is no getting away from the fact that there is no finer seaman in the world than the British sailor; but take the average merchant ship and you will find that on the day of sailing nearly all the seamen go on board rolling drunk. They tumble on board at the last moment. Go down to the docks any day and you will see what happens. You will see the sailors in a drunken state, or in that worse condition when the liquor is dying out of them. The master starts for sea, but he is often obliged to anchor until the men become sober. When they do get over their cups the chances are that the master has got to lick them into shape. The British sailor is a tough handful, and with a mixed crew of Englishment, Scotsmen, and Irishmen a master has a mighty stiff job; and of the three nationalities I confess a depraved Scotsman is worse to control than an Englishman and Irishman rolled into one. This matter of nationality reminds me that on board one vessel I sailed we had a man who came on board drunk in London, and did not turn to until we crossed the equator. He was a Swede. When foreigners first join British ships they are all right, but the peculiar influence of our ships often makes them as bad as the British seaman. Swedes and Norwegians particularly drink as heavily as the British sailors, but they are easier to handle than the British."

"What you have said, I think, applies to three-fourths of the British seamen. What of the royal navy?"

"There you have an entirely different condition of things. In the royal navy you have the fine flower of British sailordom. You have discipline. That is the whole secret. In the mercantile marine there is no discipline. What I have said applies only to some tramp steamers and most sailing ships. It does not apply to the royal navy or to the great passenger liners. There is an entirely different set of conditions prevailing on board the great liners. A seaman could not be better off than on board a Castle liner, a White Star, or Cunard liner, or a Peninsular & Oriental boat. On these you have good grub, good wages, and continuity of employment. All the things we want to see made universal the seaman has there. The result is that the men try to keep their berths, and they do not go on board drunk. In the tramp steamer and the sailing ship—and sailing ships are far more numerous than is generally supposed—there is no continuity of service, and the conditions, generally speaking, are such that there is little comfort and no discipline on board. In the royal navy, for instance, you have perfect discipline. A seaman knows that as the night follows the day, punishment will follow disobedience. In the mercantile marine a man can do what he likes, and who can punish him?"

"Then what does this condition of affairs tend to when a seaman is anxious to lift himself out of these drunken and disorderly surroundings?"

"It simply tends in one direction. Either a seaman finds a place in one of the great liners or he leaves the sea altogether. Ship owners and philanthropists may say what they choose, but that is the effect. The life on board the average tramp steamer or sailing ship at present is not worth living. Not until the people of this country realize its importance and insist upon its being lifted out of its present condition will the mercantile service be improved. I do not believe there is a civilized country in the world where you will find more ignorance of the condition under which the sailor lives than in Britain. Why, in America, away even in Wisconsin or Colorado, you will find more knowledge of the sailor and his ships than you will in the most populous centers of this country. The British people, in fact, do not realize the immense importance of the mercantile marine to our daily life. They do not understand that if our oversea traffic were suspended for a single week the price of the ordinary loaf would rise to two shillings or more."

FROM STEEL CORPORATION REGARDING STRIKE.

The strike in the mills of the American Sheet Steel Co. and American Steel Hoop Co. does not appear to be regarded by the United States Steel Corporation as of unusual significance or importance. After a discussion of the matter by Judge E. H. Gary and Charles M. Schwab the following statement was issued from the office of the executive committee:

"The United States Steel Corporation is simply a stockholding company and does not in any respect direct the management of any company in whose stock the former is interested. Information has been received from the offices of the American Steel Hoop Co. and the American Sheet Steel Co. that questions have been under discussion by them and representatives of the Amalgamated Association of Iron, Steel & Tin Workers growing out of the request by the latter to extend union labor into mills in which union labor has not heretofore existed, and that the officers of the two companies above named have expressed their willingness and promptly signed the Amalgamated Association's scale for the mills in which the union has heretofore existed, but not for other mills. No question as to the amount of wages is involved."

One of the executive officers makes the following additional statement:

"We do not regard the strike of the Amalgamated Association of Iron, Steel & Tin Workers as of very serious import. In the first place none of the Carnegie companies nor the tube company is union and only about half of the workmen in the sheet steel plants belong to the union. In fact about 60 per cent. of the iron and steel workers of our corporation are non-union men. In the second place the wage scale of the tin plate workers has already been agreed upon and these men will not strike. Therefore, but a small percentage of employees is likely to go out at this juncture. July 1 has for a number of years been the time fixed by the iron and steel operators and workmen for the adjustment of wage scales and other matters between them. It has become almost customary in many mills for a shutdown at this period to take place while questions of differences were being arranged. A year ago many of the tin plate mills were closed down about six weeks on this account. The workmen themselves have come to look upon this period of the year as a good time for a vacation after eleven months of continuous labor. The men realize that they are now receiving the highest wages ever paid in their branch of work. They also realize that the wage scale formulated by the Amalgamated Association has been accepted by the corporation. The only trouble is over the demand that non-union mills be treated as if they were union mills. This naturally the steel corporation refuses. It is not believed that the Amalgamated Association seriously considers that this demand on its part will be acceded to. It is altogether probable that the association, after a few weeks, will recede from its position and the men will return to work at the wages agreed upon. At any rate the strike will not seriously affect the business of the United States Steel Corporation. It has men enough and mills enough which it will be able to continue in operation to keep fairly well up with its contracts."

ADVANTAGES OF MECHANICAL DRAFT.

In the Engineering Record of recent date Mr. Henry C. Meyer, Jr., says: "Draft produced by fans possesses many advantages over chimneys ordinarily proportioned. Probably the greatest of these is the fact that it is possible to regulate the speed of the fan so that the proper rate of combustion for the amount of steam required is maintained entirely independent of the weather conditions. Another important advantage is the ability of the fans to create a much greater draft than is possible with a chimney. Steam engines for driving fans are frequently fitted with valves arranged to govern the speed of the engine according as the boiler pressure varies, increasing it as the pressure falls and reducing it as it rises above the normal. Mechanical draft enables economizers to be placed in the flue and reduce the temperature of the escaping gases by heating the feed-water far below the temperature that is necessary in a chimney to create a draft. The reduction in draft due to the use of economizers is a much greater percentage of the available draft with a chimney than it is of the draft where fans are employed. Again, the greater draft of fans enables cheap-low-grade fuels to be burned that could not easily be used with chimney draft, and the saving that the fuels bring about in some localities is a very considerable sum of money. Still another point in favor of mechanical draft lies in the portability of the fans in case a change of location is desired."

The British naval program contemplates the construction of three battleships, six armored cruisers, two third-class cruisers, ten torpedo boat destroyers, five torpedo boats, two sloops and five submarines. The latter, however, were ordered and work begun on them last year. Nothing can be learned regarding the design of these boats, though the impression prevails that they are Holland boats. The naval bill calls for an expenditure of £9,000,000 for new construction.

Owing to the strike among the machinists, work has been entirely suspended upon the California, South Dakota, Wyoming, Tacoma and Milwaukee, building for the United States navy at the Union Iron Works, San Francisco.

EXPORT TRADE IN COAL.

The hostility to the export duty on coal continues to grow in England. It is held to be a blow to a very considerable industry which is daily having harder conditions to meet and which needs, indeed, more help than hindrance. England has played a pretty important part in supplying the coal shortage of European countries, though its home consumption has grown enormously. The following tables show how important is this branch of English trade:

State.	Home coal supply. Per cent.	Imported from Britain. Per cent.	Imported from other countries. Per cent.
Russia	81.54	13.02	5.25
Sweden	8.76	87.94	3.03
Spain	62.78	32.98	4.24
Italy	6.39	90.05	3.56
Austria	65.04	1.08	33.88
France	72.29	13.80	13.91
Belgium	83.41	4.25	12.34
Germany	92.63	5.37	2.00

During the past eighteen years England's export trade has practically doubled as is seen herewith:

Year.	Coal production.	Coal exported.	Remaining for home consumption.
1883	163,737,000	29,442,000	134,306,000
1889	176,917,000	37,138,000	139,779,000
1893	164,326,000	37,489,000	126,863,000
1899	220,085,000	55,810,000	164,277,000

The history of the past sixteen years shows a large increase in the coal output of the world. Countries which hardly suspected they had a coal supply have now an enormous output and where it is not domestically consumed it naturally seeks an export market. The following tables show its growth in tons, the years 1883 and 1899 being selected:

Country.	1883.	1899.
Great Britain	163,737,000	220,085,000
India	1,315,000	4,604,000
Canada	1,806,000	4,566,000
New South Wales	2,521,000	4,706,000
Victoria	500	343,000
British South Africa	19,000	580,000
Germany	55,943,000	101,622,000
France	20,759,000	32,331,000
Belgium	18,178,000	21,918,000
Russia	3,964,000	12,185,000
Spain	1,044,000	2,672,000
United States	102,868,000	230,000,000

The United States is sending some coal to Europe. It is not much but it is sufficient to show that inroad can be made upon the natural English market. As far as the West Indies and Central America are concerned American ships furnish them all the coal they need. This, at one time, was exclusively English.

TRADE NOTES.

The Wellman-Seaver Engineering Co. of Cleveland expects to occupy its new pattern shop by July 15 and its new machine shop by Aug. 15.

The Crane Co. of Chicago has issued a new edition of the circular giving lists and dimensions of flanged fittings and gate valves for steam pressure up to 125 lbs. The measurements have in some cases been changed so that it would be necessary to have one of these circulars in making plans for piping. The circular can be had upon request.

In the new steamship Lyra of the Boston Tow Boat Co.'s fleet the installation of electric lights is remarkably complete, including even the holds, so that darkness may not interfere with loading and discharging cargo. The dynamo and engine—forming a compact generating unit—were designed and built by the B. F. Sturtevant Co. of Boston, Mass.

Sayen & Schultz, Thirteenth and Commerce streets, Philadelphia, manufacturers of mechanical rubber goods of all kinds, are constantly publishing attractive advertising matter. A large illustrated sheet, just received from them, deals with specialties in the line of packing which they control. One of these is the Melville sheet gum packing, patented by Rear-Admiral George W. Melville, chief of the bureau of steam engineering, navy department, and manufactured by the Philadelphia firm. This packing is a white rubber compounded with heat resisting minerals. It is made with iron, brass or cloth insertion, is adapted to steam and hydraulic joints, and can be re-used. It is especially adapted to marine use and has a very wide sale. Melville boiler and mud drum gaskets are also made by Sayen & Schultz.

Joseph Allen, No. 1 South Front street, Philadelphia, manufacturer of packings—condenser tube packing, metallic packing, etc.—has issued a catalogue upon the subject of his products that is certainly out of the ordinary. He says in the preface: "A word to engineers! Would you rather deal with a practical man who has made the packing of engines and pumps a study for years or a salesman whose object is to make sales only? I employ no salesmen but give my customers the benefit of their expense. My experience enables me to guarantee results. If I can assits an engineer to run his plant on the most economical basis I make that man a friend as well as a customer. That is my object. Special work requires special packing. There never was a packing manufactured that will do for all kinds of work." The catalogue will be sent to anyone for the asking.

The compound marine engines, both fore and aft and vertical tandem, as built by Marine Iron Works, station A, Chicago, have met with considerable favor on the Atlantic and Gulf of Mexico coasts, that company having built eighteen sets of them for those waters so far this year. 4

THE GUARDIAN TRUST COMPANY,

108 SUPERIOR STREET, CLEVELAND, O.

OFFERS SUBJECT TO PRIOR SALE

$150,000

First Mortgage 5% Gold Bonds

—OF—

The Calumet Transportation Co.

secured by "Blanket" Mortgage upon the new Steel Steamers

G. A FLAGG, RANDOLPH S. WARNER,

each 336 ft. length, 42 ft. beam and 26½ ft. depth,

and upon new Steel Schooners

A. W. THOMPSON, S. D. WARRINER,

each 300 ft. length, 42 ft. beam, 24 ft. depth.

Combined capacity of four vessels, 18,000 tons.

$633,000

First Mortgage 5% Gold Bonds

—OF—

THE GLOBE STEAMSHIP CO.

secured by "Blanket" Mortgage upon the new Steel Steamers

NEPTUNE, URANUS,

VENUS, MARS,

SATURN, JUPITER,

each 366 ft. length, 48 ft. beam, 28 ft. depth, and of 6,000 tons capacity.

These bonds are secured by mortgage or deed of trust to the Guardian Trust Co., as Trustee, in the one case upon two modern, new steel steamers and two new steel schooners, and in the other case upon six modern, new steel steamers, the insurance upon which, payable to and deposited with the trustee in the interest of the bondholders, exceeds in each case the total bond issue. The bonds mature in annual installments and as no part of the mortgaged property can be released until every bond is paid, the margin of security constantly increases.

As the bonds mature in yearly installments from 1902 to 1913, either long or short time securities can be furnished to suit purchaser.

Both bonds and semi-annual interest coupons are payable at office of The Guardian Trust Co., Trustee.

Prices to net the investor 4¾%.

Special descriptive circular upon application.

CUBAN HARBOR SURVEYS COMPLETED.

The survey of the harbors of Cuba by the navy department to ascertain the best location for United States naval stations has been practically completed, and the gunboats Vixen and Yankton, which have been doing most of the surveying, have left Gibara on the north coast, the former for Hampton Roads and the latter for San Juan, Porto Rico. They will proceed later to Boston for repairs. The data now at hand are sufficient to justify the selection of the strategic points in Cuba to be used as naval stations, and the government will negotiate with the Cuban government, when it has been established, for transfer to the United States of four sites. These are located in Nipe bay, Guantanama bay, Cienfuegos harbor and Havana harbor. Careful attention to the geographical and strategic importance, as well as the depth of the water at these places, was given.

The main idea was to select points at the extreme eastern and western ends of the island and on the north and south coast, but there was no suitable harbor near Cape San Antonio on the extreme west commanding the Yucatan channel, or near Cape Mays' on the extreme east commanding the Windward passage, and this brought about the determination to have stations on the northern and southern coasts as near to the eastern and western ends of the island as possible. Havana was naturally selected for the western station on the northern coast, but it was not easy to find a good harbor near the western end on the southern coast. Cienfuegos, although a considerable distance from the western extremity of Cuba and near the center of the southern coast, presented the best location. All the intervening water close to the coast between that point and Cape San Antonio is shallow, and Cienfuegos was regarded as the best base of operations against an enemy attempting to reach the United States by means of the Yucatan channel. Its harbor is land-locked and has plenty of water, and this determined its selection. Some consideration was given to the selection of Santiago near the eastern end of the southern coast, but the entrance to the harbor was not suitable for big ships. Guantanamo, forty miles east of Santiago, which the United States ships used as a coaling base in the operations against Toral's army and Cervera's squadron, has a better harbor, and was considered an ideal location for a naval base. For the station on the eastern end of the northern coast, Nipe bay was chosen without question. It is land-locked and can be connected by canal, which the government intends to build, with Levisa bay also land-locked.

The Havana station is admirably situated for the base of a fleet engaged in guarding the Nicholas channel and the Santaren channel, which unite with the old Bahama channel close to the coast of Cuba. Nipe is well situated for guarding the eastern end of the old Bahama channel and as a base of operations to guard the Windward passage. Havana and Cienfuegos are admirably located for fleet operations to protect the Yucatan channel, and Havana and Key West for protecting the straits of Florida. Guantanamo and Cienfuegos would be bases of a naval campaign in the Carribbean sea.

GROWTH OF FORE RIVER SHIP & ENGINE CO.

In his fifteenth report Horace G. Wadlin, chief of the Massachusetts bureau of statistics, says of the phenomenal growth of the Fore River Ship & Engine Co. of Quincy, Mass.:

Under its old title, in 1899, the company obtained a contract to construct two 400-ton torpedo boat destroyers for the United States government, and, early in 1900, they were awarded the contract for the 3,500-ton protected cruiser Des Moines. In this same year they completed a 600-ton light ship for the government, and in February, 1901, were awarded the contract for the two 15,000-ton battleships. In this connection, it is interesting to note the rapid progress made by this establishment since it began operations in 1884. At that time the company occupied a very small plant and employed during the first year only six men, while the value of the product did not exceed $10,000. In 1886 100x50 ft. was added, a large number of up-to-date machine tools were purchased, and the land area increased to two acres. In 1890 the company began building the hulls of yachts and tugs, in addition to the machinery, the largest being about 100 tons. Previous to this, the number of employes had been gradually increased from six to 200, and during 1900 the maximum number reached 500. In the present year the force will be gradually increased beyond 1,000 and it would not be surprising to find 2,500 men employed at these works in 1902. In 1900 the company designed and entered upon the construction of its great ship building plant at Quincy Point. This action was taken in order to acquire more room and greater depth of water, and also because the tools to be installed for the construction of the 3,500-ton cruiser were heavy enough to build much larger ships, and it was not deemed advisable to set up such appliances in a locality where they could not be fully utilized. The plant when fully completed will be one of the largest in the United States, and capable of finishing complete the largest mercantile or war ship yet designed. The area embraced by the plant is 75 acres, including docks. The buildings, which are very systematically arranged, consist of forge, boiler, machine, joiner, and carpenter shops, storehouse, foundry, tool house, restaurant, and office. All heavy machines and ship building tools are operated by independent electric motors, instead of being driven by belts, while the small machine tools are arranged in groups under short shafts, each shaft being run by an electric motor. The plant of the plant includes a floating dock which will probably be constructed within the coming year.

The firm of H. I. Crandall & Son, East Boston, Mass., builders of the well-known Crandall marine railway, has been reorganized. H. I. Crandall & Son Co. (engineers and contractors) is the name of the new concern. James L. Crandall is president and Percy H. Middleton, vice-president and secretary. A new departure is the designing and building of light-draught river steamers, hydraulic dredges and dredging machinery.

The facilities at our disposal and our operative system are such as to insure most favorable quotations and deliveries for any part of the world.

American Bridge Company

GENERAL OFFICES
100 BROADWAY
NEW YORK

OF NEW YORK.

21-162.

SEVEN-MASTED STEEL SCHOONER—SHIP YARD NOTES.

A contract for the construction of the first seven-masted steel schooner ever floated has been awarded to the Fore River Engine Co., Quincy, Mass. The vessel will be built entirely of steel and will be ready for launching about the end of next February. She is to be designed by B. B. Crowinshield, who designed the yacht Independence. The new schooner will be larger than the majority of tramp steamships. She will carry 8,000 tons of cargo. Her masts will be of metal and she will be heated and steered by steam and lighted by electricity. In view of the departure in ship building involved in the construction of this vessel, the Review hopes to print, a little later on, a set of plans, together with a detailed description.

The Merrill-Stevens Engineering Co., Jacksonville, Fla., is building a steamer for the Fayetteville & Wilmington Steamboat Co. The new steamer will engage in the passenger trade on the Cape Fear run between Fayetteville and Wilmington, N. C. The vessel will be 124 ft. long and 24 ft. beam. This company is also building a steamer of 135 ft. length for W. T. Gibson of Savannah, to engage in the freight and passenger business on the Savannah river. A small steamer is also being built for the Tropical Fiber Co. of Sanford. The company is at present enlarging its facilities and is now engaged in erecting a large machine shop.

The steel freight and passenger propeller which the W. R. Trigg Co., Richmond, Va., is building for the Old Dominion Steamship Co., is promised for the fall. The vessel is of the following dimensions: Length, 200 ft.; beam, 35 ft.; depth, 17 ft. 3 in. The engine is of the inverted, triple expansion type, with cylinders 18, 29 and 48 in. diameter and 30 in. stroke. Steam will be supplied by two steel cylindrical boilers with grate surface of 122 sq. ft. and heating surface of 3,840 sq. ft.

The Pusey & Jones Co., Wilmington, Del., is building a steamer for the Marthas Vineyard & Nantucket Steamboat Co. The vessel will be 187 ft. in length, 31 ft. beam and 12 ft. deep. She will have a speed of 15 miles an hour, freight capacity of 40 tons and passenger capacity of 1,200. The engine is to be of the surface condensing beam type, with 42 in. cylinder diameter and a stroke of 10 ft. The boilers will be of the flue and return tubular type.

Smith & Barbey, 43 Nassau street, New York, have received an order through the German embassy in Washington to design a yacht for the emperor, somewhat on the lines of the Induna, formerly the Yampa, the American yacht now owned by the emperor. The new vessel will measure 120 ft. on the water line.

The Enoch Moore & Sons Co., Wilmington, Del., are building for Baltimore parties a wooden boat of the following dimensions: Length, 140 ft.; breadth, 23½ ft.; depth, 8 ft.

The Lee line of Memphis, Tenn., has contracted with Howard's Ship Yard, Jeffersonville, Ind., for a stern-wheel steamer to run from Memphis to Fulton.

BIGGEST DORY IN THE WORLD.

The biggest dory in the world has just been constructed at Whitcomb's ship yard, Provincetown, Mass., for Col. Charles Ledyard Norton of New York city and Sandwich, Mass. The general public knows the dory as a small boat in common use by the fishermen along the Atlantic coast and fishermen know it to be an uncommonly light, handy and safe craft for use in any sort of weather. Some large boats of this type have been built in recent years by men who recognized the worth of the dory as an all-round fine carrier and wind-jammer, but the man of liveliest imagination in the combined ranks of shoals trawling and Grand banks handlining forces never yet conceived a dory of such proportions as the one just completed. Crowds of fishermen have inspected it of late, and all united in the belief that the craft could sail around the world unharmed if desired.

The dimensions of this dory, or "house-dory," as the owner-originator has styled the craft, are 45 ft. over all, 14 ft. wide amidships, 7 ft. deep from gunwale to floor. The craft has the conventional flaring stem and tombstone, these of good oak. To sawed knees of hackmatack the flooring or bottom of 2-in. and the siding of 1½-in. hard pine planking are fastened. The half-round bilge of the famous Swampscott dory is wholly lacking in this craft, as is the graceful sweeping floor and sheer spring common to the average dory, but the craft is an out-and out dory nevertheless—just at present. A little later, when the house has been fitted in, the fitness of the name "house-dory" will be apparent.

This craft will be towed to Sandwich and there the owner will equip her with a house, spars and sails, after which he will take her around the cape to Buzzards bay, where he will pass the summer cruising. The spacious cabin house will extend from stem to stern, the only break being in the after portion where a well-like cockpit will be placed, and will be highest amidships, the house roof sloping thence fore-and-aft to the line of the stem and stern. This cabin will be conveniently and comfortably furnished, for the owner intends to spend much of his time both summer and winter hereafter in the cozy interior, cruising in northern waters during the summer season and probably in Florida waters during cold weather. The craft will be steered with a tiller. Her canvas will consist of two mutton-leg sails, spread on main and foremasts, and a jib.

The French minister of Marine recently approved contracts relating to the lighting of the arsenals of Toulon and Bizerte. These two important contracts were given one to the Lighting Electric Co., No. 27 Rome street, Paris, and the other to the establishment of Becanville, Senior, of Petit-Bourg. The machines and the steam generators will be supplied by Delaunay, Belleville & Co. of St. Denis-sur-Seine.

One cent a mile to Buffalo via the Nickel Plate Road, good going on July 2, 9, 16, 23 and 30, and returning within three days from date of sale. Write, wire, 'phone or call on nearest agent, or E. A. Akers, C. P. & T. A., Cleveland, O. July 30

BELLEVILLE GENERATORS

Grand Prix 1889 — Hors Concours 1900

Originated 1849 — Latest Improvements 1896

Number of Nautical Miles made each year by Steamships of the Messageries Maritimes Co., Provided with Belleville Generators—Since their Adoption in the Service.

Year.	Australien	Polynésien	Armand Béhic	Ville de la Ciotat	Ernest Simons	Chili	Cordillère	Laos	Indus	Tonkin	Annam	Atlantique
1890	67,728	2,460										
1891	68,247	68,331	204									
1892	68,247	68,403	69,822	23,259								
1893	68,379	68,343	68,286	68,247								
1894	68,439	68,367	68,574	68,439	37,701							
1895	68,673	68,766	68,739	68,808	40,887	28,713						
1896	69,534	92,718	69,696	69,549	62,205	63,153	40,716					
1897	68,250	69,606	92,736	69,555	62,235	76,110	63,357	43,146				
1898	70,938	69,534	69,552	69,597	62,526	63,240	63,240	62,553	63,954	22,707		
1899	69,534	69,615	67,431	90,405	60,246	62,778	62,868	52,344	54,855	44,007	22,884	
1900	69,534	67,494	69,744	69,564	61,719	62,382	62,502	51,471	53,373	62,016	63,066	52,140
Total	757,503	713,637	644,784	597,423	387,519	356,376	292,683	209,514	172,182	128,730	85,950	52,140

ATELIERS ET CHANTIERS DE L'ERMITAGE, À ST. DENIS (SEINE), FRANCE.

WORKS AND YARDS OF L'ERMITAGE AT ST. DENIS (SEINE), FRANCE.

TELEGRAPHIC ADDRESS: BELLEVILLE, SAINT-DENIS-SUR-SEINE.

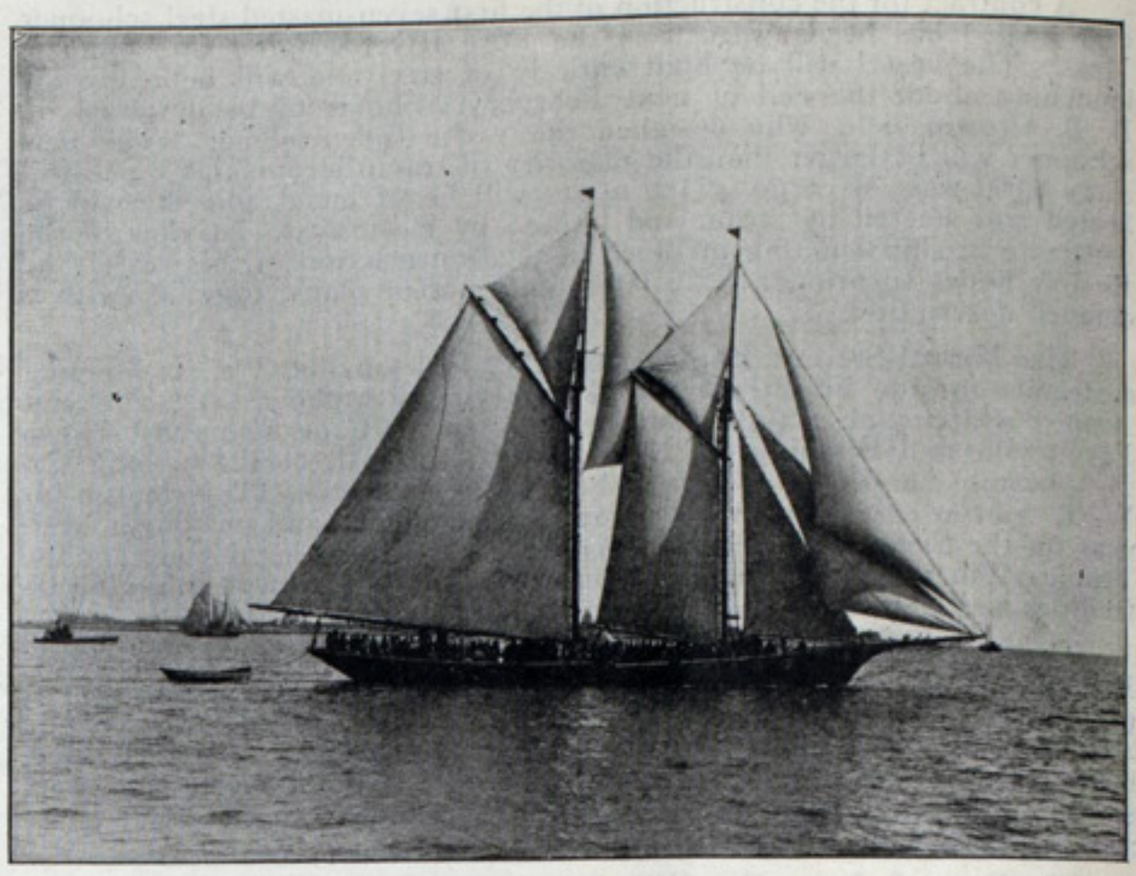
PRESERVATIVE FOR METAL.

The Protectus Co., North American building, Philadelphia (offices also in Chicago and Pittsburg), claims to have an absolute preservative for iron and steel, as used in ships, bridges and all kinds of structural work, and they are certainly meeting with wonderful success in the sale. A circular dealing with the preservative, which is known as "Protectus," is as follows:

"The great amount of steel in structural work makes it especially important that the metal be absolutely protected against rust and corrosion. These always take place unless the metal in the structure is entirely protected from contact with the air. To the structural engineer, this protection from corrosion is of the greatest importance, for nowithstanding the large factor of safety (4 to 6), with which his work is designed, no structure, however carefully designed, can have a factor of safety sufficiently high to guard against the subtle and inroading action of rapid corrosion. Roof trusses over terminals, subject to the sulphurous fumes of locomotive gases, and plate girders crossing other roads, and especially near stations where locomotives stop directly beneath, have been found to be unsafe and useless in less than ten years. The steel frame of the sky-scraper, being called upon to withstand the corrosive action of the air, not for years but for decades, and being placed within walls where it cannot be inspected, requires the fullest protection. To do this properly a paint of the highest grade only must be employed, and it must offer an impervious coating to the moisture containing the chemical constituents so detrimental to iron and steel. No material advancement in the manufacture of preservatives for iron and steel has been made until recently. Engineers, for the lack of something better, continuing to specify pure red lead and linseed oil. We have discovered, and are now offering to the public at a reasonable cost, 'Protectus,' an absolute preservative for metal against rust and corrosion. It is elastic, tenacious, impervious to moisture and unaffected by atmospheric gases, heat or cold; does not contain linseed or fish oils or substitutes for same; has covering and lasting qualities much greater than any paint. It preserves wood as fully as metal, and in mechanical application differs in no essential particular from the application of paints in general use. It is made in colors."

Reduced rates to New York—Beginning July 1 the Nickel Plate road will sell excursion tickets to New York city at reduced rates with a liberal stop over privilege at Buffalo, thus giving ample time to visit the Pan-American exposition. Tickets may be procured good going and returning via different routes if desired. Write, wire, 'phone or call on nearest agent, or E. A. Akers, C. P. & T. A., Cleveland, O. 105, July 15.

A Noted Pleasure Craft.



YACHT HELEN MILLER GOULD.

The Toronto Navigation Co. has been organized to run steamers between Toronto, Niagara-on-the-Lake and Youngstown, N. Y. The company has purchased the steamboat Queen City and the old Dominion government cruiser Druid. The Queen City will be renamed Canada and the Druid Niagara.

"Seaboard Steel Castings."

MANUFACTURERS OF
"THE ADMIRAL" ANCHOR.

THE LATEST AND BEST STOCKLESS ANCHOR.
APPROVED BY LLOYD'S.

ANCHORS CAST AND TESTED ON ORDER, OR STOCK ORDERS PROMPTLY FILLED.

A GUARANTEE OF QUALITY.

OPEN-HEARTH STEEL CASTINGS OF THE HIGHEST GRADE.

FACILITIES FOR CASTINGS UP TO 80,000 POUNDS WEIGHT.

MACHINE WORK AND PATTERNS FURNISHED WHEN REQUIRED.

RAIL OR WATER DELIVERIES.

CAPACITY, 1500 TONS PER MONTH

Seaboard Steel Casting Co.,

CHESTER, PA.

"BENEDICT-NICKEL" SEAMLESS TUBING
FOR CONDENSER TUBES

Contains NO ZINC nor any weakening metal.
Send for Booklet with treatise on "Electrolysis of Condenser Tubes."

Benedict & Burnham Mfg. Co., *Mills and Offices,* Waterbury Conn.
New York. 253 Bd'wy. Boston, 172 High St.

BURNISHINE.

THE MOST MARVELOUS METAL POLISH IN THE WORLD.

In Liquid and Paste Form.

Will Polish Hot or Cold Metal, no matter which.

Produces a wonderfully brilliant lustre on brass, copper, nickel and all metals, no labor required.

Used on steamers all over the world.
Free samples on application.

J. C. PAUL & CO.
57 Dearborn St., CHICAGO, ILL.

It is up to you Mr. Engineer.

We have shown you time and again in the advertising pages of the leading engineering journals that we are the manufacturers of

High Grade Packings

for every purpose. They are reliable, durable, economical and guaranteed. All we ask is an opportunity to convince you of

THESE SOLID FACTS.

Will you give us that opportunity?

Send for catalogue and samples to our nearest office.

THE GARLOCK PACKING CO.

NONE GENUINE — TRADE Garlock MARK — WITHOUT IT.

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Boston. Pittsburg. Denver.
Chicago. Cleveland. San Francisco.

MAIN OFFICES AND FACTORIES:
PALMYRA, N. Y.; ROME, GA.

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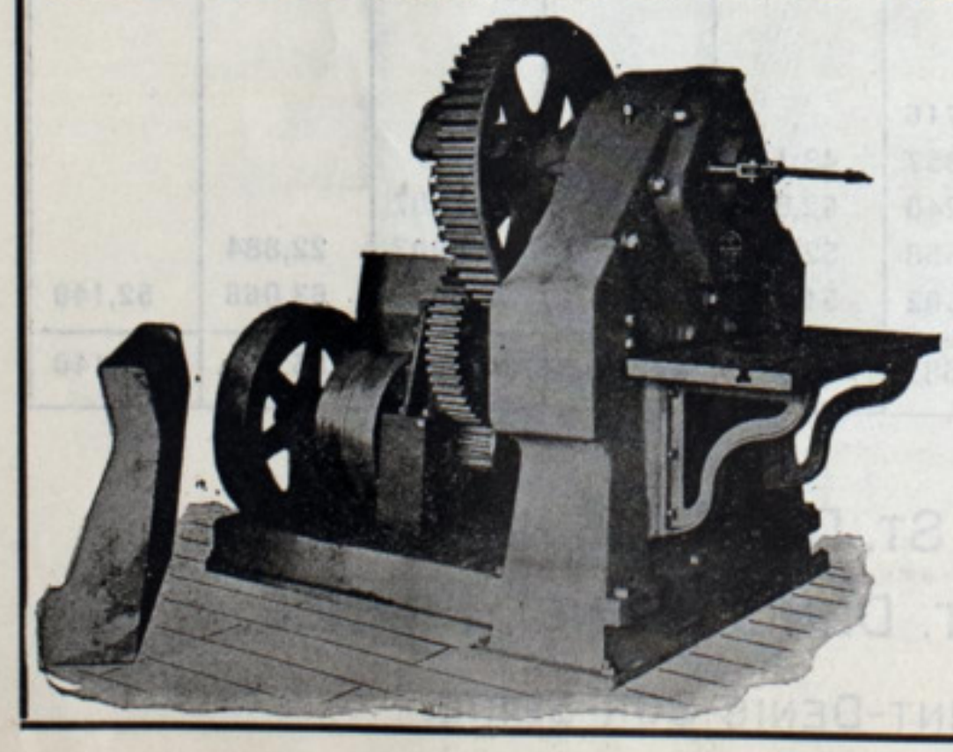

ANGLE SHEAR

WHICH IS ARRANGED TO CUT ANGLES SQUARE, OR AT ANY ANGLE, UP TO 60 DEGREES.

All gearing is below the main shaft, which insures smooth running, and is protected from injury by guards. Another valuable feature is that the strain of cutting angles is taken on the center line of each plunger and its bearing, no offsets being required in either slide. We build this shear in several sizes with capacities to cut from the smallest to the largest angles.

Further particulars furnished upon application.

THE CLEVELAND PUNCH & SHEAR WORKS CO.,
CLEVELAND, O., U. S. A.